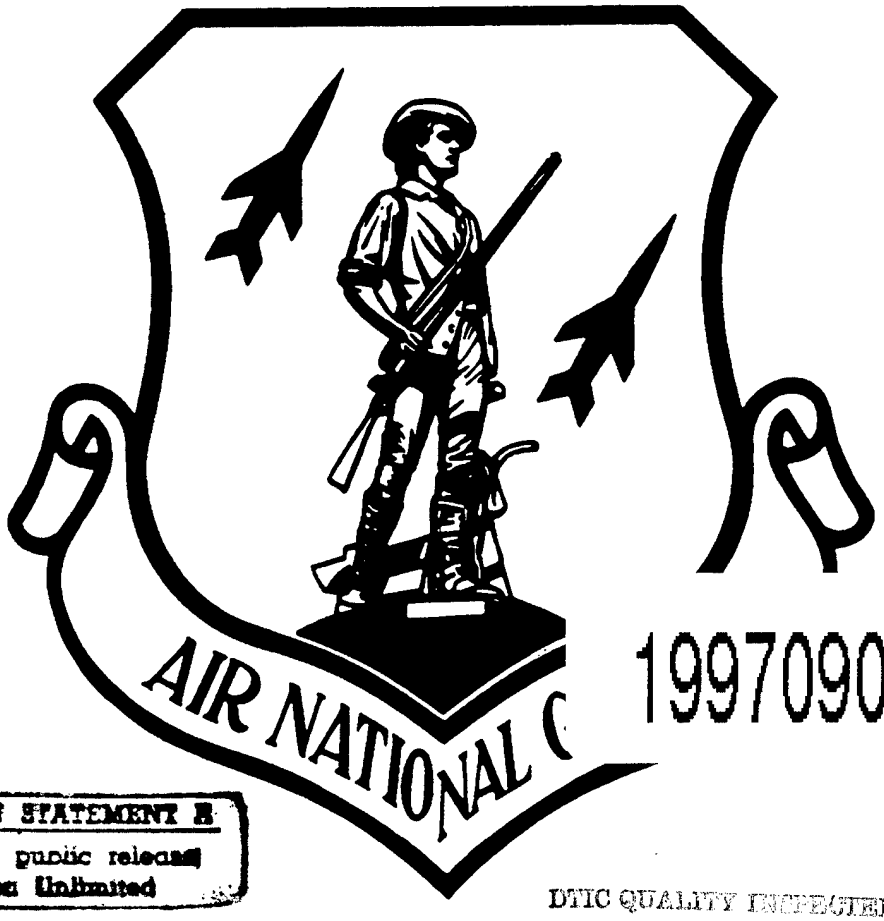
INSTALLATION RESTORATION PROGRAM

Groundwater Sampling/Pumping Test Technical Memorandum

144TH FIGHTER WING
CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL, FRESNO, CALIFORNIA



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The technical memorandum summarizes the activities and findings of the deep aquifer investigation at the California Air National Guard Base, Fresno, CA. The deep aquifer investigation was performed from October through December 1993 to characterize the vertical extent of contamination in the groundwater beneath the Base. The investigation targeted PCE and TCE compounds.

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List of Acronyms

the Base	California Air National Guard Base
BCP	Base collection pond
b	aquifer thickness
bgs	below ground surface
cl	clay
DCP	dichloropropane
ft^2/day	square feet per day
gpm	gallons per minute
IT	IT Corporation
K	hydraulic conductivity
ml	silt
msl	mean sea level
µg/L	micrograms per liter
PCE	tetrachloroethene
PVC	polyvinyl chloride
RI	remedial investigation
S	storativity
SI	site investigation
T	transmissivity
TCE	trichloroethene
TM	Technical Memorandum
VOC	volatile organic compound

1.0 Introduction and Project Context

This technical memorandum summarizes the activities and findings of the continuing deep aquifer investigation at the California Air National Guard Base (the Base), located at the Fresno Air Terminal in Fresno, California (Figure 1). A brief overview of the rationale and field activities is presented, followed by laboratory results and data analysis and interpretations.

A site investigation (SI) was conducted at the Base from July 1990 to February 1991. Four sites were investigated for the presence of soil and groundwater contamination. Furthermore, groundwater was investigated Base-wide for the presence of contaminants. The results are fully discussed in the SI report (IT Corporation [IT], 1992). A potential fifth site was identified during the SI activities. As a result, a focused remedial investigation (RI) was conducted at the newly identified Site 5 (the Base collection pond [BCP]) from August to October 1992. The results are presented in the interim report of findings for the focused RI (IT, 1993a). In conjunction with the focused RI, a quarterly groundwater sampling and monthly groundwater monitoring program was conducted from June 1992 through May 1993; this program is summarized in the quarterly groundwater monitoring report, April 1993 (IT, 1993b). During the SI, focused RI, and monitoring program, the nature and lateral extent of groundwater contamination in the uppermost water-bearing zone (water table aquifer) was characterized.

A deep aquifer investigation was performed from October through December 1993 to characterize the vertical extent of contamination in groundwater beneath the western portion of the Base. Identified groundwater contamination consisted of chlorinated volatile organic compounds (VOC), primarily trichloroethene (TCE) and tetrachloroethene (PCE). The deep aquifer investigation targeted these compounds and related VOCs for vertical characterization below the water table and the results are preliminarily discussed in the initial deep aquifer investigation technical memorandum (TM) (IT, 1994). The initial deep aquifer investigation provided good insight into the hydrogeologic regime from the water table (approximately 80 feet below ground surface [bgs]) to a depth of 250 feet bgs. However, the information gained did not define the degree of interconnection among the hydrogeologic units of interest. For this reason, pumping tests were performed to assess the communication between specific hydrogeologic zones. The 1993 investigation also determined the need for additional groundwater sampling data from the deep monitoring wells installed. Deep monitoring well groundwater sample results are presented in this TM along with results from the pumping tests.

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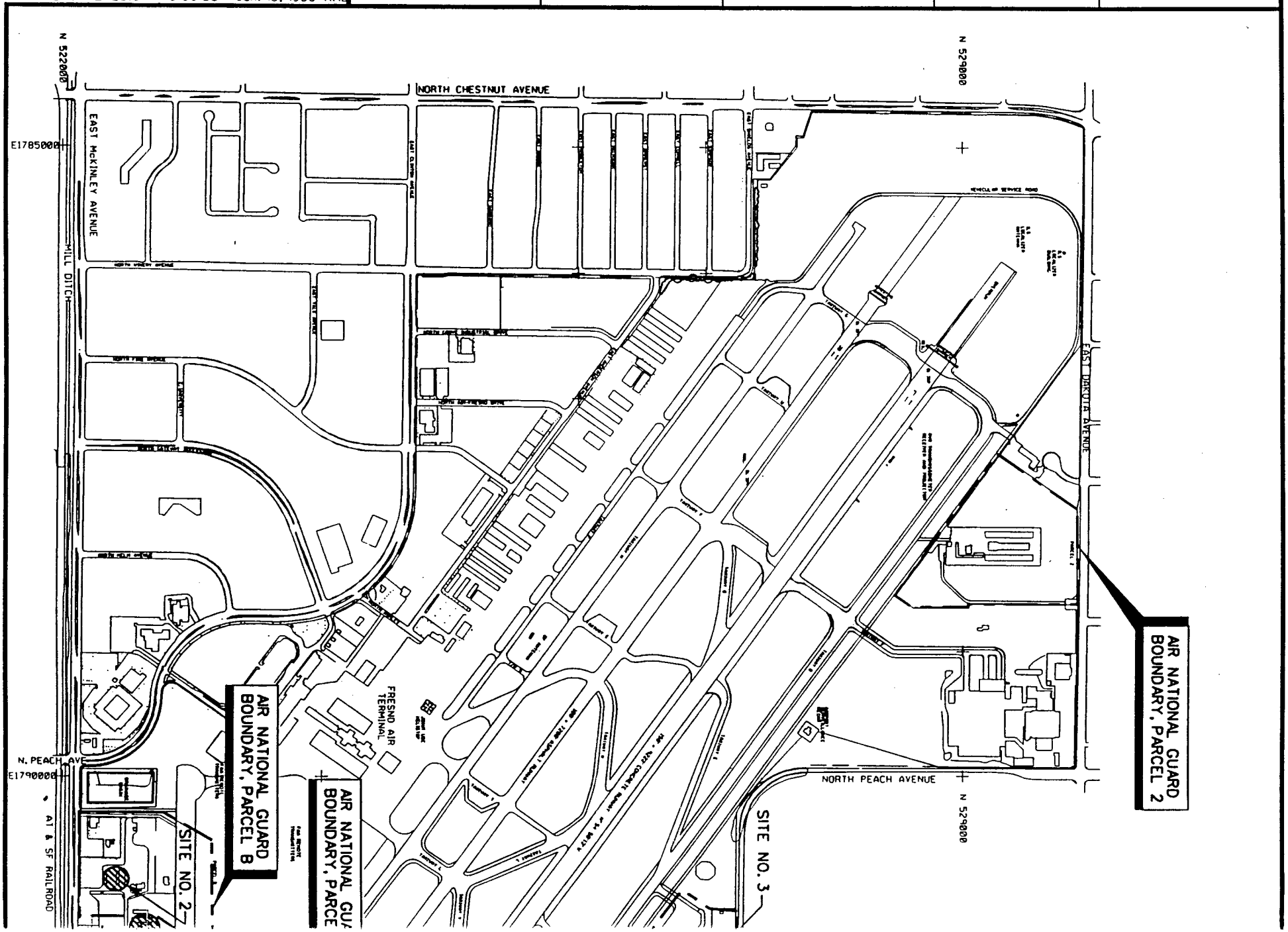

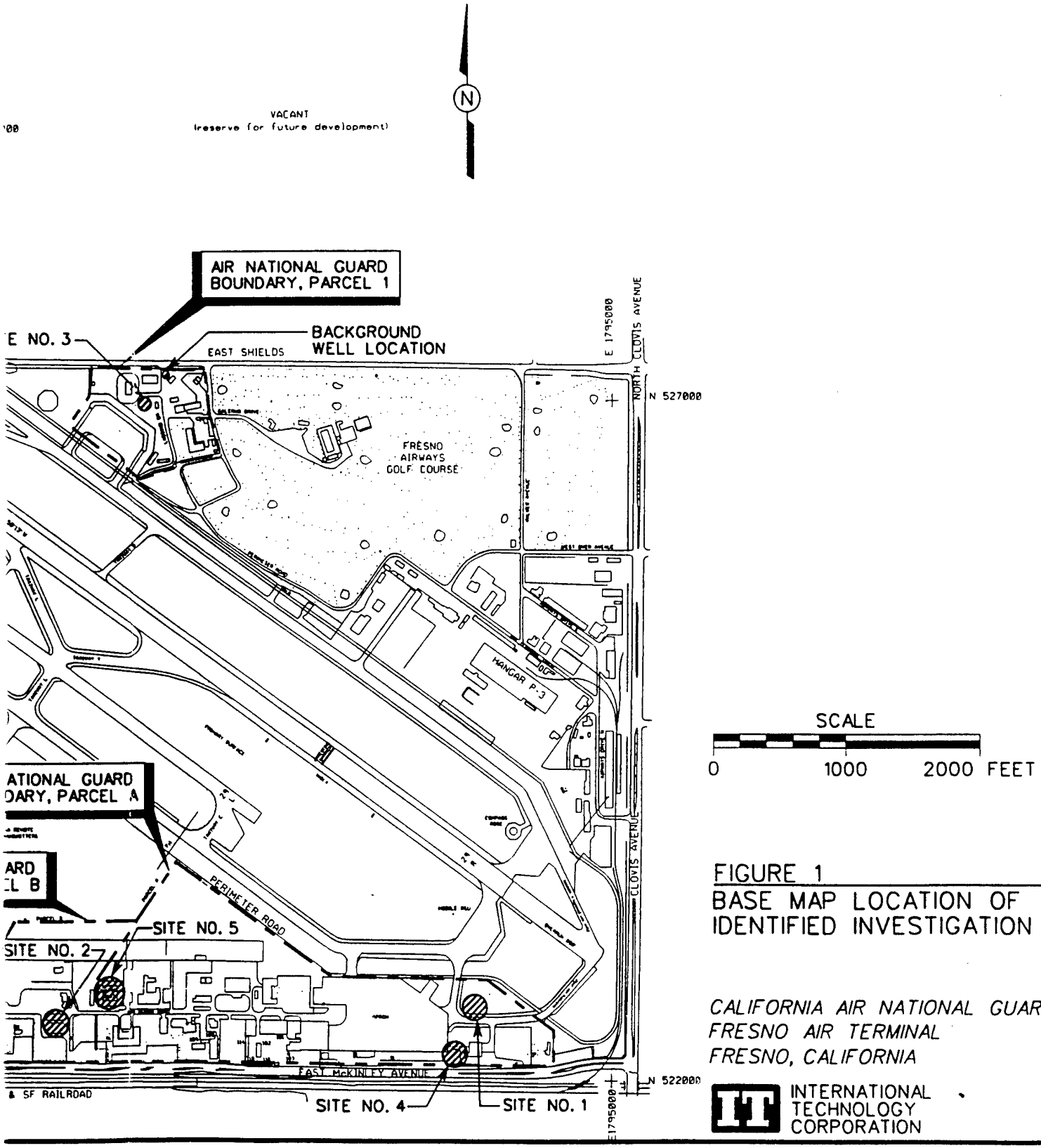

FIGURE 1
BASE MAP LOCATION OF IDENTIFIED INVESTIGATION SITE

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(2)

LEGEND:

— — — PROPERTY BOUNDARY

SCALE

0 1000 2000 FEET

FIGURE 1
BASE MAP LOCATION OF
IDENTIFIED INVESTIGATION SITES

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2.0 Background and Objectives

2.1 Groundwater Sampling

Several monitoring wells have been installed into the uppermost water-bearing unit across the western portion of the Base (Figure 2). They have been sampled on six different occasions during the SI and quarterly sampling program. During the initial deep aquifer investigation, eight deeper monitoring wells were installed and groundwater samples collected. Deep wells are those noted with a "B" or "C" suffix on Figure 2. A second round of samples from the deep monitoring wells was collected in association with the pump test activities to confirm the initial round of sampling, which occurred in 1993.

2.2 Pumping Tests

Eight wells installed during the initial deep aquifer investigation were installed into two aquifer zones below the water table. During the initial deep aquifer investigation, PCE was determined to be the contaminant of concern related to past Base disposal activities (IT, 1994) and the deep monitoring wells were installed within and below the PCE plume. The zones chosen for the monitoring wells were based on identified stratigraphic intervals and chemical screening data. However, the hydraulic communication among the stratigraphic units could not be determined by the initial investigation.

The zones into which the deep monitoring wells were installed were randomly noted as the "B" and "C" zones, with the water table wells constituting the "A" zone. From the deep aquifer investigation, it appears that the "A" and "B" zones are connected and are part of the same aquifer. Between the "B" and "C" zones, a thin aquitard was observed across much of the Base. This aquitard does not appear to be continuous, and would inhibit but not prevent the downward migration of contaminants. Therefore, the "A", "B," and "C" zones are asserted to all be part of one aquifer, within which there is a varying degree of hydraulic communication.

The current monitoring well network across the western portion of the Base is shown in Figure 2. Wells with a "B" or "C" suffix are installed into the intermediate and deep portions of the uppermost aquifer. Wells in Figure 2 with an "A" or no suffix are screened across the water table.

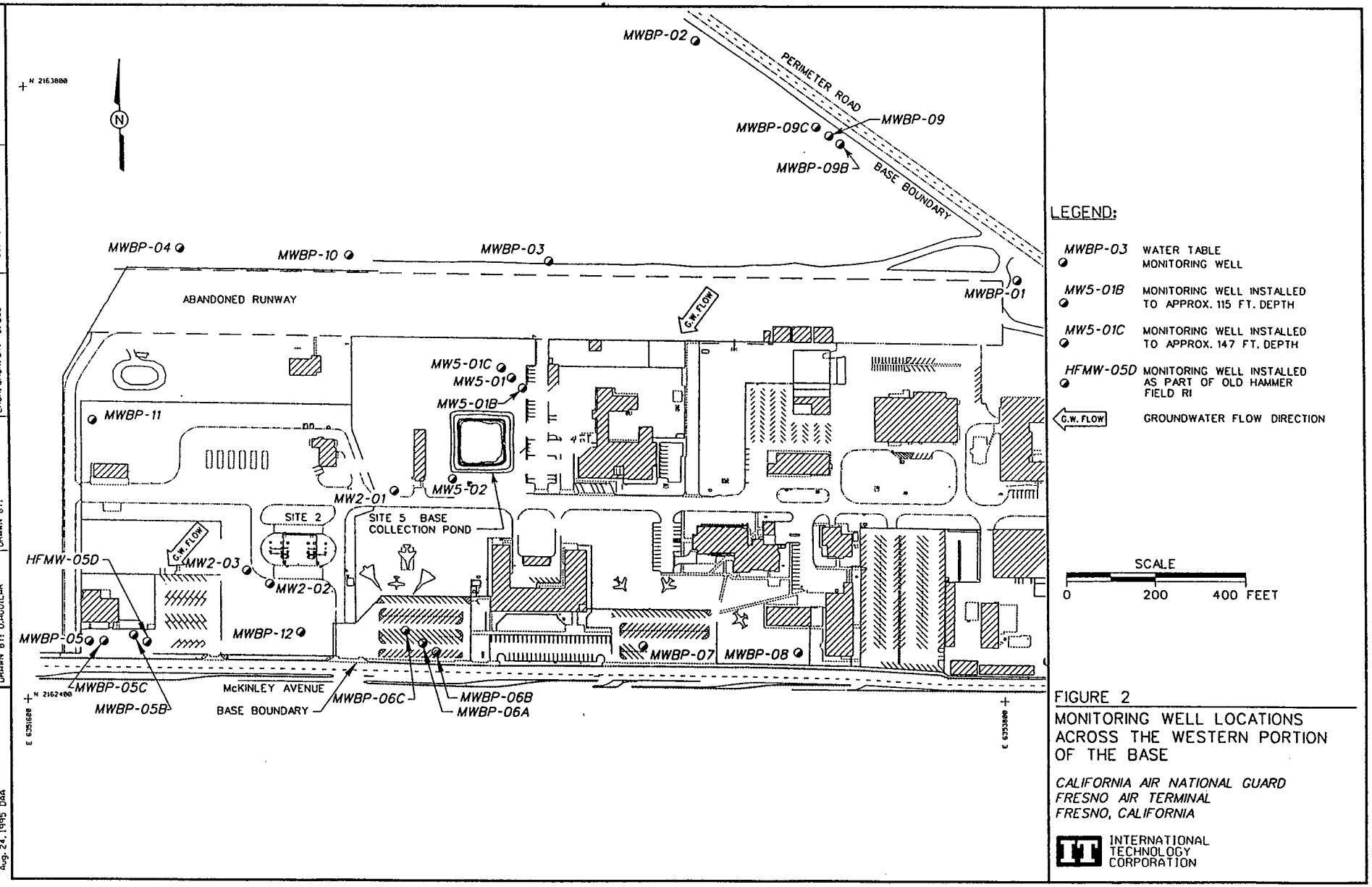

FIGURE 2

MONITORING WELL LOCATIONS ACROSS THE WESTERN PORTION OF THE BASE

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Considering this background information, pumping tests were performed to:

- Determine the degree of interconnection between the "A" and "B" zones.
- Supplement and refine the existing hydrogeologic data by determining aquifer parameters within the radius of influence around the pumped wells.

To satisfy these objectives, pumping tests were performed in monitoring wells screened in the "A" and "B" aquifer zones.

Contamination has not been detected in the "C" aquifer zone. If remedial actions are considered warranted for the existing contamination, these actions would focus on the depths at which contamination is present. Pumping tests performed in the "C" zone, while they would provide hydrogeologically interesting information, would not produce valuable information for the remedial effort; therefore, pumping tests were not conducted in the "C" zone.

3.0 Field Activities

The following field activities were performed in accordance with the pump/aquifer test addendum to the site investigation sampling and analysis plan (IT, 1995).

3.1 Groundwater Sampling

Eight existing deep ("B" and "C" zone) monitoring wells were sampled from February 14 through 17, 1995. A minimum of three well casing volumes of water were removed from each well with an environmental submersible pump. The pump was placed no more than 5 feet below the top of water in the casing and purge rates averaged 3.5 to 4 gallons per minute (gpm). Samples were collected with a decontaminated Teflon bailer. Analytical parameters for each sample were VOCs by methods 8010/8020.

During the sampling effort, short-term "pretests" were also conducted in three water table ("A" zone) monitoring wells in an effort to identify the most suitable well for further pump testing and piezometer installation.

3.2 Pumping Tests

Five separate phases were incorporated into the pumping test program: short-term "pretests", piezometer installation, background monitoring, step-drawdown tests, and constant rate tests. The "B" well selected for testing was MWBP-05B due to its location within a contaminated aquifer zone and its proximity to other existing monitoring wells. Short-term pretests were conducted in three shallow ("A") wells to identify the most suitable shallow well for testing around which piezometers would be installed. Wells tested were MW5-01, MW5-02 and MWBP-12 (Figure 2) based on the criteria outlined in the sampling and analysis plan addendum (IT, 1995). The environmental submersible pump used during well sampling was used to incrementally stress the shallow aquifer in the three wells for approximately 45 minutes; drawdown was manually recorded. Both MW5-02 and MWBP-12 proved suitable for more rigorous pump testing. MWBP-12 was the final selection for pump testing and piezometer installation because it is located within the water table contaminant plume.

Piezometers were installed around both wells to be tested (MWBP-12 and MWBP-05B). Water levels in two background wells were continually monitored during the pumping tests to observe ambient groundwater fluctuations. Step-drawdown tests were performed in MWBP-12 and MWBP-05B to ensure that the aquifer was adequately stressed during the constant rate tests.

3.2.1 Piezometers

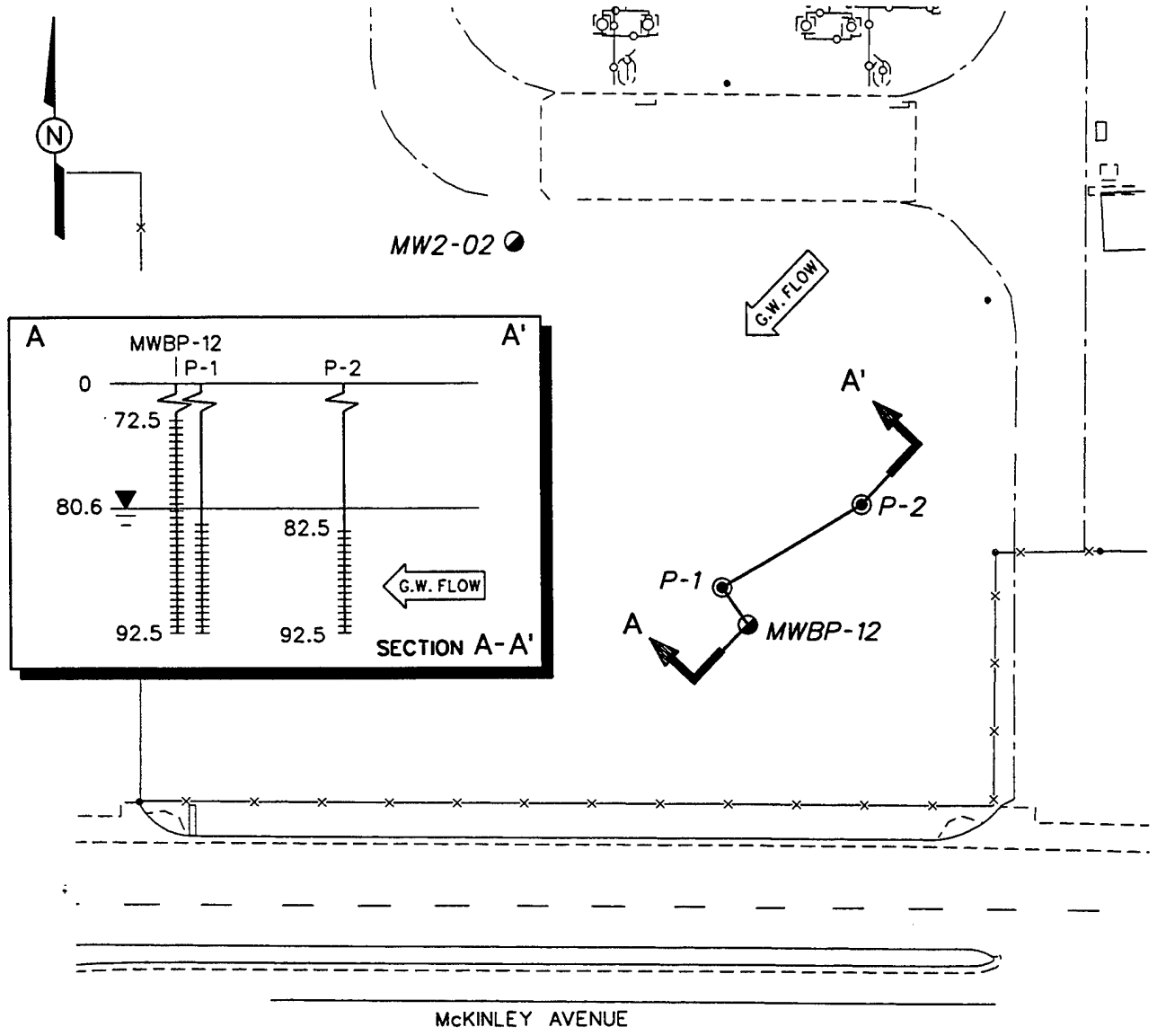
A total of five piezometers were installed in support of the pumping tests. Two (P-1 and P-2) were placed near MWBP-12 (Figure 3) and three (P-3B, P-4A, and P-5B) were installed near MWBP-05B (Figure 4). Placement of the piezometers was oriented both upgradient of and perpendicular to the prevailing flow direction. Distances of the piezometers from the pumping wells was determined based on simplistic computer modeling of aquifer stresses using preliminary hydrogeologic parameters from slug tests, well purging information, and the short-term pretests.

Drilling of the piezometer boreholes was accomplished with hollow-stem augers to the desired completion depth. Piezometers were constructed with 1.5-inch outside diameter polyvinyl chloride (PVC) screen (0.010-inch slot) and casing. Screen lengths were 10 feet. Depths of the piezometers were predetermined based on the zone to be monitored. The piezometers at MWBP-12 were installed to a depth of 92.5 feet bgs, identical to the depth of MWBP-12. Piezometers P-3B and P-5B were installed to the same depth as MWBP-05B (116 feet bgs). To provide water level data from the shallow zone near MWBP-05B, piezometer P-4A was installed approximately 10 feet below the water table (depth of 93 feet bgs). This provided shallow-zone drawdown measurements near MWBP-05B; existing shallow well MWBP-05 also provided shallow-zone measurements at a greater distance from MWBP-05B. Table 1 lists the piezometer construction and other comparative information for the wells utilized during the pumping tests.

3.2.2 Background Monitoring

The shallow and intermediate depth zones of the uppermost aquifer were selected for pump testing. To monitor ambient groundwater level fluctuations during the tests, continual water level monitoring was conducted in a water table well and the "B" well (MWBP-09 and MWBP-09B, Figure 2). Pressure transducers were installed into these two wells and measurements were recorded every 20 minutes with a data logger. Verification of fluctuations were made with periodic manual water level measurements.

Background monitoring began on March 16, 1995; the first pump tests began on March 21. A break in background monitoring was necessary due to Base activities on March 25 and 26. Ambient monitoring was reestablished before the pumping tests continued on March 27, 1995. In addition to the water level measurements, records of hourly barometric pressure data were obtained for the testing period from the National Weather Service office located immediately north of the Fresno Air Terminal.



SCALE

0 50 100 FEET

LEGEND:

- MWBP-12 WATER TABLE MONITORING WELL
- P-1 PIEZOMETER
- G.W. FLOW GROUNDWATER FLOW DIRECTION

FIGURE 3
PUMPING TEST SETUP
AT MWBP-12

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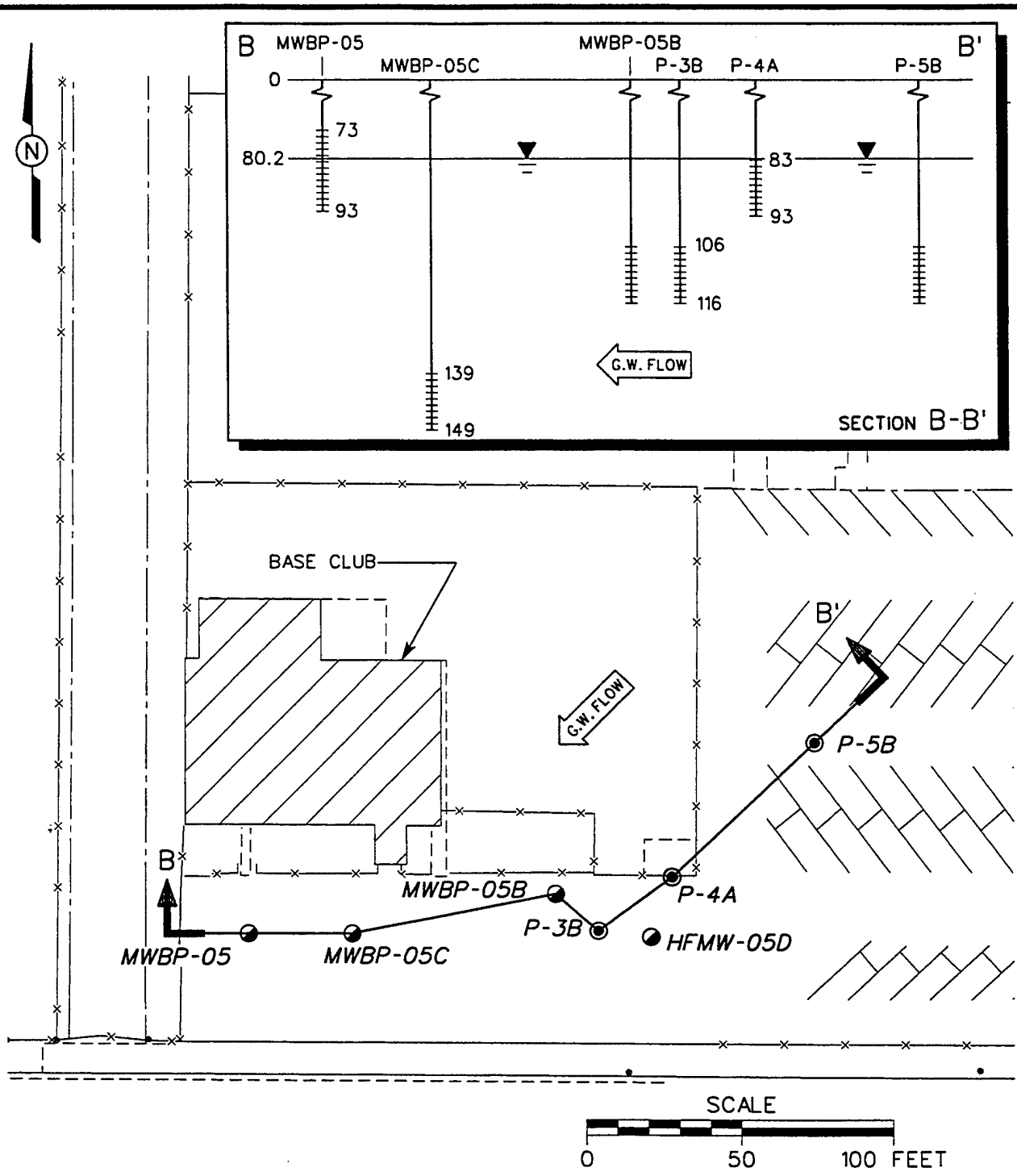

LEGEND:

- MWBP-05 — MONITORING WELL
- P-3B — PIEZOMETER
- G.W. FLOW — GROUNDWATER FLOW DIRECTION

FIGURE 4
PUMPING TEST SETUP
AT MWBP-05B

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		DWG. NO.409724ES.015	PROJ. NO.:409724

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Table 1

Piezometer Construction Summary
California Air National Guard, Fresno, California

Piezometer/Well ID	Installation Date	Ground Surface Elevation[a]	Screened Interval[b]	Distance from Pumping Well (feet)	Northing	Easting
MWBP-12	09-22-92	320.8	72.5 - 92.5	0	2162553.0	6352214.7
P-1	03-16-95	320.9	82.5 - 92.5	15	2162565.3	6352206.4
P-2	03-17-95	320.8	82.5 - 92.5	50	2162588.9	6352248.7
MW2-02	10-02-90	321.3	72 - 92	130	2162663.5	6352146.5
MWBP-05B	11-08-93	320.5	106 - 116	0	2162545.7	6351838.1
P-3B	03-13-95	320.7	106 - 116	20	2162533.6	6351853.7
P-4A	03-14-95	321.5	83 - 93	40	2162551.9	6351877.4
P-5B	03-15-95	321.7	106.1 - 116.1	99	2162595.6	6351923.1
MWBP-05	10-25-90	320.3	73.1 - 93.1	102	2162531.1	6351737.2
MWBP-05C	11-07-93	320.3	139.2 - 149.2	69	2162531.7	6351770.9
HFMW-05D[c]	03-24-94	-	335 - 345	33	2162531.8	6351870.0

[a]Feet mean sea level.
[b]Feet below ground surface.
[c]Installed by ERM-West as part of Old Hammer Field regional investigation.

3.2.3 Step-Drawdown Tests

Step-drawdown tests were conducted in MWBP-12 and MWBP-05B on consecutive days. Drawdown measurements were recorded in the pumping well and nearby piezometers with a pressure transducer and data logger. Table 2 lists the pumping rate steps, the step duration, and drawdown measured in the pumping well.

The wells were pumped with a 4-inch submersible pump and flow rates were measured with an in-line flow meter. Extracted groundwater was treated with a portable activated carbon treatment system and the treated water was stored at the well head in a 7,000-gallon tank for later disposal. Samples of the extracted groundwater were collected before and after treatment to assess the effectiveness of the contaminant removal.

Pumping rates were selected while the test was in progress in order to adequately stress the aquifer. The information obtained from these tests was used to provide the optimal pump rate to be used during the constant rate tests.

3.2.4 Constant Rate Tests

Constant rate tests were performed after the step-drawdown tests were conducted and evaluated in the respective pumping wells. Pressure transducers were placed into several nearby observation wells during the tests. Pump discharge rates, selected based on the results of the step-drawdown tests, were kept constant for the duration of the tests. Extracted water was again treated through the activated carbon system and the treated water was temporarily stored before it was released. Since the effectiveness of the well-head treatment system had been demonstrated during the step-drawdown tests, samples of treated groundwater were not collected prior to disposal.

Well MWBP-12 was pumped at 7.5 gpm for a period of 20 hours. Drawdown measurements were recorded automatically in the pumping well and in P-1 and P-2. Manual measurements were collected periodically from wells MW2-02 and MW2-03 (Figure 3). Due to excessive drawdown in MWBP-12, the test was stopped after 20 hours; the original intent was to conduct the test for 36 hours. From the step-drawdown test, it had appeared as though MWBP-12 could sustain a rate of 7 to 8 gpm. Unexpectedly, the aquifer was dewatered.

Well MWBP-05B was pumped at 16 gpm for 36 hours. Drawdown measurements were electronically recorded in P-3B, P-4A, P-5B, and HFMW-05D. The latter well was installed as a

Table 2

Step-Drawdown Test Summary
California Air National Guard, Fresno, California

Well ID	Step Number	Step Duration (min)	Pump Rate (gpm)	Maximum Drawdown (feet)	Specific capacity (gpm/ft)[a]
MWBP-12	1	30	2.5	1.48	1.69
	2	50	5	3.24	1.54
	3	70	6.5	5.02	1.29
	4	60	7[b]	5.63	1.24
MWBP-05B	1	45	6	3.73	1.61
	2	130	12	7.84	1.53
	3	70	18	13.13	1.37
	4	30	19[b]	13.84	1.37

[a]Specific capacity = pump rate/drawdown.
[b]Maximum pump output.

part of the more regional Old Hammer Field investigation. Manual measurements were collected periodically from MWBP-05 and MWBP-05C (Figure 4).

3.2.5 Investigation-Derived Waste

Purge water and decontamination water generated from the groundwater sampling activities was emptied into the sump at the temporary decontamination pad on Base. The water was allowed to evaporate. Water remaining at the end of the pumping test field activities was pumped through the activated carbon system and was then released to the BCP.

Water extracted during the pumping tests was immediately treated at the well head with the activated carbon system. The system consisted of two 55-gallon activated carbon units that were used in series. The first drum removed the majority of the contaminants and the second unit was used as a polishing unit. Influent and effluent samples were collected from each pumping well during the step-drawdown tests. Samples were analyzed for volatile organics on an accelerated schedule. Results of the analyses showed low levels of contaminants entering the system but not leaving the system.

Wastewater sample results demonstrated that the treatment system was working as expected and water that had been temporarily stored was released to the BCP (Figure 2) through a series of piping laid out across the Base. All of the waste water was released in this manner after it had been treated.

4.0 Results

4.1 Groundwater Sampling

Results of the VOC analyses from the eight deep monitoring wells are summarized in Table 3. Earlier sample results are shown for comparison.

TCE was detected in all eight wells, consistent with the previous sampling event. However, in each case, samples from February 1995 were lower than concentrations reported in December 1993. Concentrations in February 1995 ranged from 350 micrograms per liter (µg/L) in well MWBP-09B to 4.8 µg/L in MWBP-06B (Table 3).

Results for PCE were consistent with the earlier sampling event in that it was only detected in two wells (MWBP-06B and MWBP-05B). Concentrations remained relatively unchanged. Perhaps more importantly, PCE was not detected in the "C" series wells, indicating that migration of PCE has not impacted the lower aquifer zones.

Cis-1,2-dichloroethene was detected in MWBP-06B at a trace concentration. 1,2-dichloropropane (1,2-DCP), which was detected in two wells at low concentrations in December 1993, was not detected in any February 1995 samples. Detection of 1,2-DCP has been sporadic throughout the sampling program at the Base (IT, 1993b).

4.2 Pumping Tests

4.2.1 Background Monitoring

Water level fluctuations in the background wells over the test period are shown in Figure 5. As is evident from the figure, fluctuations are inversely related to variations in the barometric pressure changes. The total differential fluctuation is approximately 0.45 feet, within the range of drawdown measurements in the observation wells during the pump tests; therefore, drawdown measurements in the observation wells were corrected based on the recorded background water level fluctuations. The break in background monitoring which occurred on March 25 and March 26 did not affect data interpretation because no tests were conducted during that time period.

Until the present, the first occurrence of water has been referred to as the water table, assuming unconfined conditions. However, the marked correlation between atmospheric pressure changes and water level changes suggests a confined or semiconfined condition (Todd, 1980; Davis and

Table 3

Summary of Deep Monitoring Well Groundwater Analytical Data
California Air National Guard - Fresno, California

	Sample No	MW5-01B-12/93		MW5-01B-2/95		MW5-01C-12/93		MW5-01C-2/95		MWBP-05B-12/93		MWBP-05B-2/95	
	Sample Date	8-Dec-93		14-Feb-95		9-Dec-93		15-Feb-95		9-Dec-93		15-Feb-95	
PARAMETER	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2-Dichloropropane	µg/L												
Tetrachloroethene	µg/L									16		9.8	
Trichloroethene	µg/L	250		200		120		81		130		56	
cis-1,2-Dichloroethene	µg/L												

	Sample No	MWBP-05C-12/93		MWBP-05C-2/95		MWBP-06B-12/93		MWBP-06B-2/95		MWBP-06C-12/93		MWBP-06C-2/95	
	Sample Date	9-Dec-93		16-Feb-95		9-Dec-93		15-Feb-95		9-Dec-93		15-Feb-95	
PARAMETER	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2-Dichloropropane	µg/L	3.9				0.88							
Tetrachloroethene	µg/L					23		18					
Trichloroethene	µg/L	62		53		7.5		4.8		260		60	
cis-1,2-Dichloroethene	µg/L					1.2		0.66					

	Sample No	MWBP-09B-12/93		MWBP-09B-12/93Z		MWBP-09B-2/95		MWBP-09C-12/93		MWBP-09C-2/95		MWBP-09C-2/95FD	
	Sample Date	8-Dec-93		8-Dec-93		14-Feb-95		8-Dec-93		14-Feb-95		14-Feb-95	
PARAMETER	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2-Dichloropropane	µg/L												
Tetrachloroethene	µg/L												
Trichloroethene	µg/L	500		520		350		25		12		10	
cis-1,2-Dichloroethene	µg/L												

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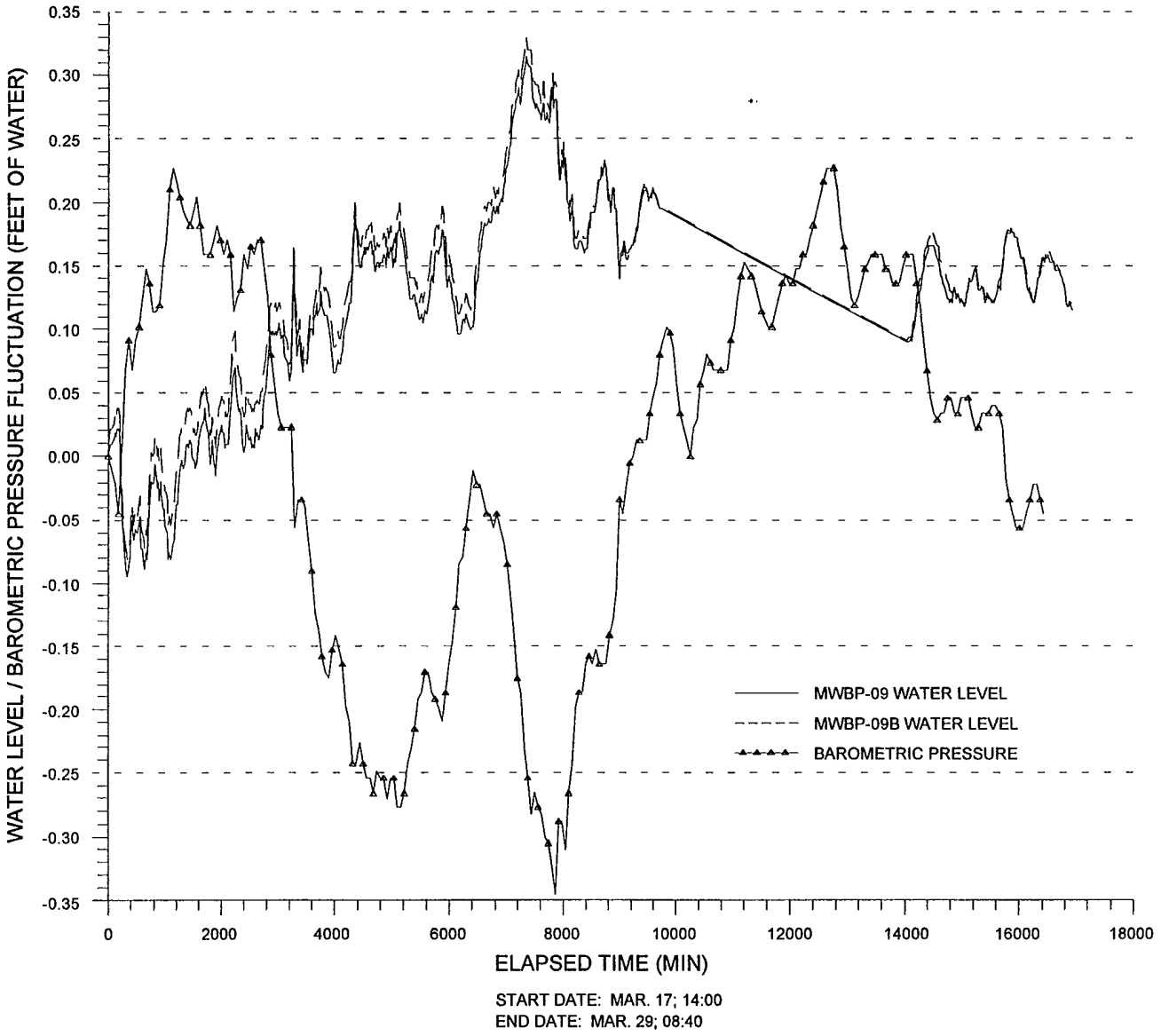

NOTES:

MWBP-09B SCREENED AT SAME DEPTH INTERVAL AS MWBP-05B

MWBP-09 SCREENED ACROSS THE WATER TABLE

BAROMETRIC PRESSURE READINGS PROVIDED BY THE NATIONAL WEATHER SERVICE, FRESNO AIR TERMINAL

FIGURE 5

BACKGROUND WATER LEVEL AND BAROMETRIC PRESSURE FLUCTUATIONS OVER TEST PERIOD

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DeWeist, 1966). The definition of the water table is that the water surface is at atmospheric pressure at all points. Fluctuations in barometric pressure would be instantaneously transmitted to the water surface and absorbed such that the fluctuations, while perhaps observable, would be dampened (Vacher, 1978). Literature generally attributes water table changes to atmospheric pressure changes only in shallow sediments (Peck, 1960; Smedema and Zwerman, 1967). Yet, correlations of water level fluctuations to barometric pressure loading cannot, by themselves, determine whether the aquifer type penetrated by a well is unconfined or semiconfined (Rojstaczer and Riley, 1990). This determination can only be made by pumping tests and a thorough knowledge of the hydrogeologic setting.

However, observations by several researchers (among others, Ferris et al., 1967, Turk, 1975) indicate that if a layer or bed of low permeability lies between the water table and the ground surface, then air flow is restricted. This implies that the atmospheric pressure changes would not be instantaneously absorbed by the phreatic surface and a resulting fluctuation would occur. This is the case at the Fresno Air National Guard Base. Figure 6 shows a cross section of sediments that are present just above and somewhat below the water table, and a fine-grained silt layer is evident. This fine-grained material is the silt (ml)/clay (cl) layer which has a bottom elevation between 245 and 255 feet mean sea level (msl).

Also of consideration is the path that water must take in order to reach the water table. The SI report (IT, 1992) shows several site-specific geologic cross sections comprising alternating beds of fine- and coarse-grained layers or beds typical of the alluvial depositional environment. Fine-grained beds inhibit downward flow of water to the water table, thus causing a tortuous path of infiltration. This condition would also hold true for the transmission of air or barometric pressure; neither can be readily transmitted to the water surface and atmospheric pressure changes would not be instantaneously absorbed.

Therefore, although the first occurrence of water may be referred to as the "water table," the aquifer behaves as though it is semiconfined as determined through pumping tests (Section 4.2.3). The correlation to barometric pressure changes with water table fluctuations also supports this aquifer type.

Barometric efficiency is defined as the change in water level divided by the change in barometric pressure for the same time period. An analysis of barometric efficiencies at approximate 24-hour time intervals was conducted for the background monitoring period. Efficiencies varied widely from 1 to 62 percent, depending on the time period. Average barometric efficiencies for the "A"

(1)

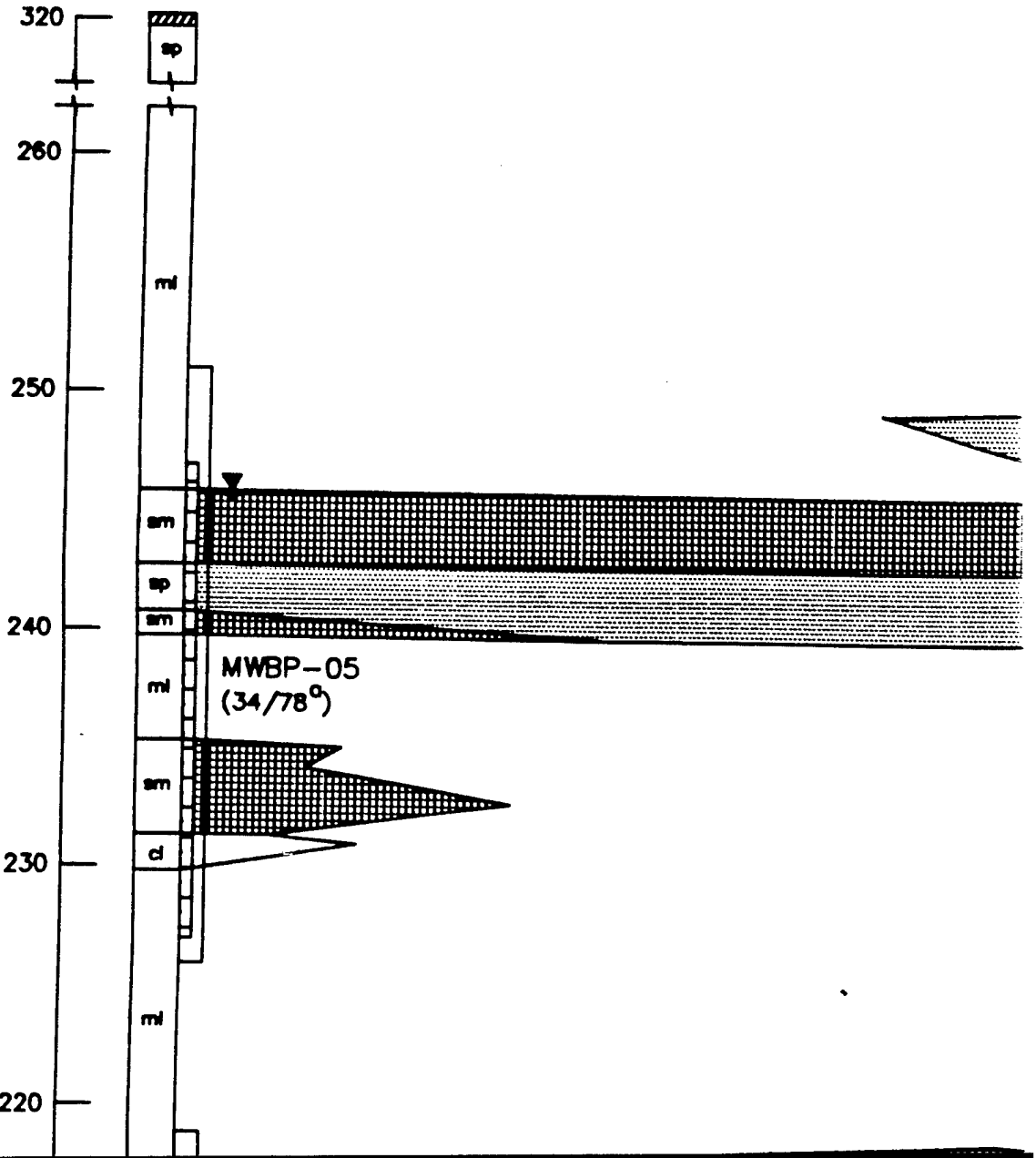
INITIATOR: S. LOGAN

PROJECT MGR.: D. BURTON

DRAWING NO.: 409724-D-135

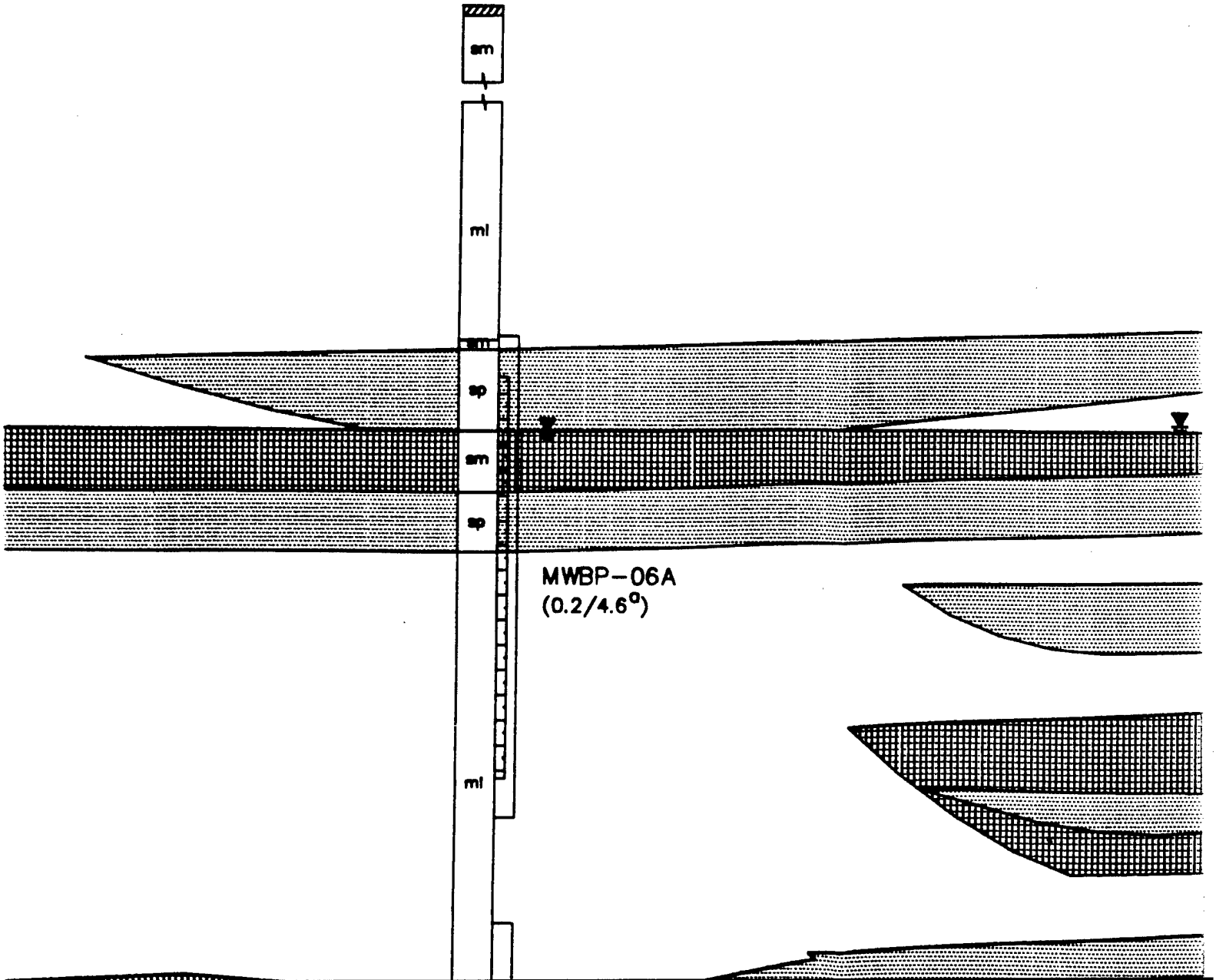
PROJECT NO.: 409724

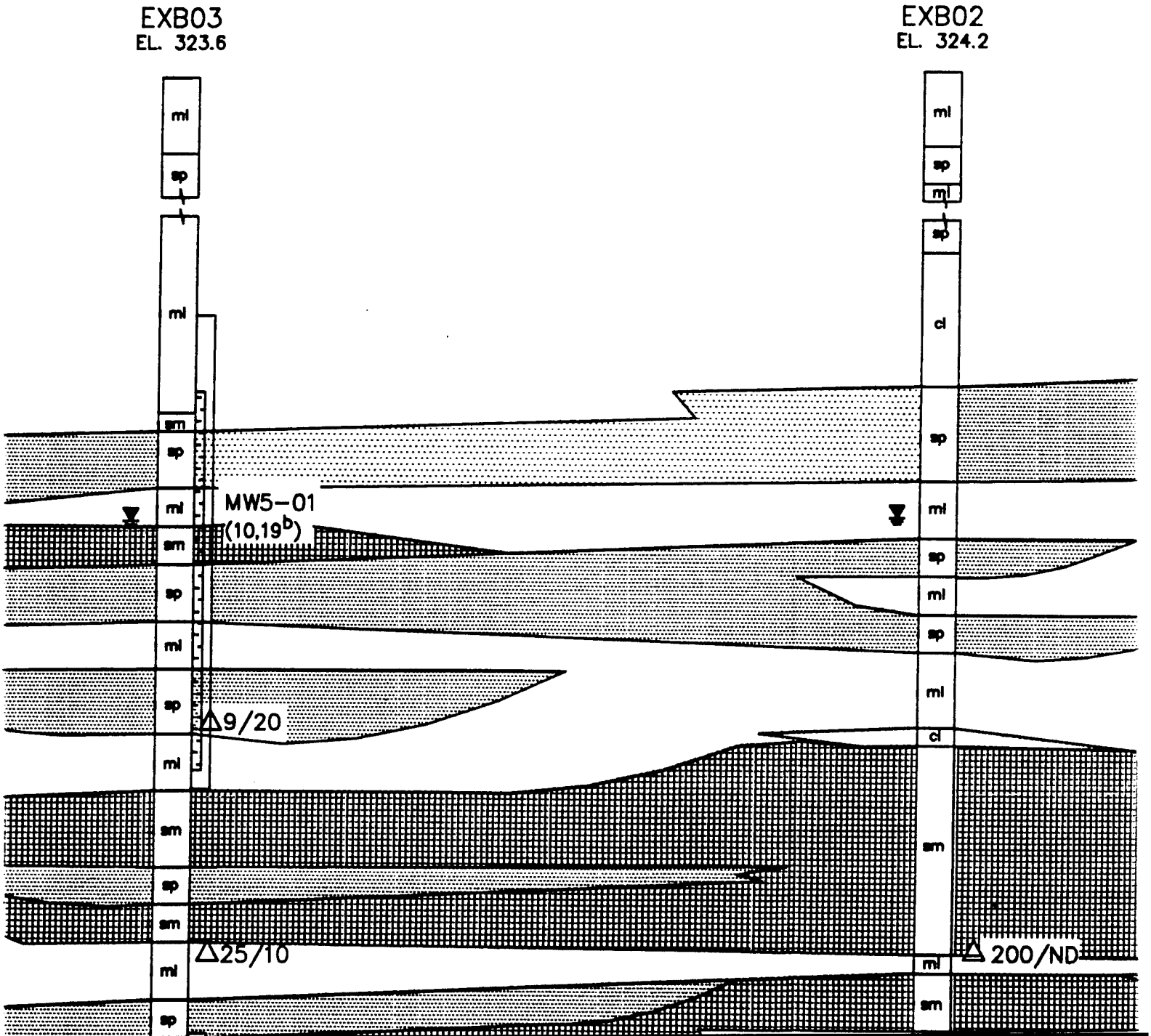
EXB05
EL. 320.3

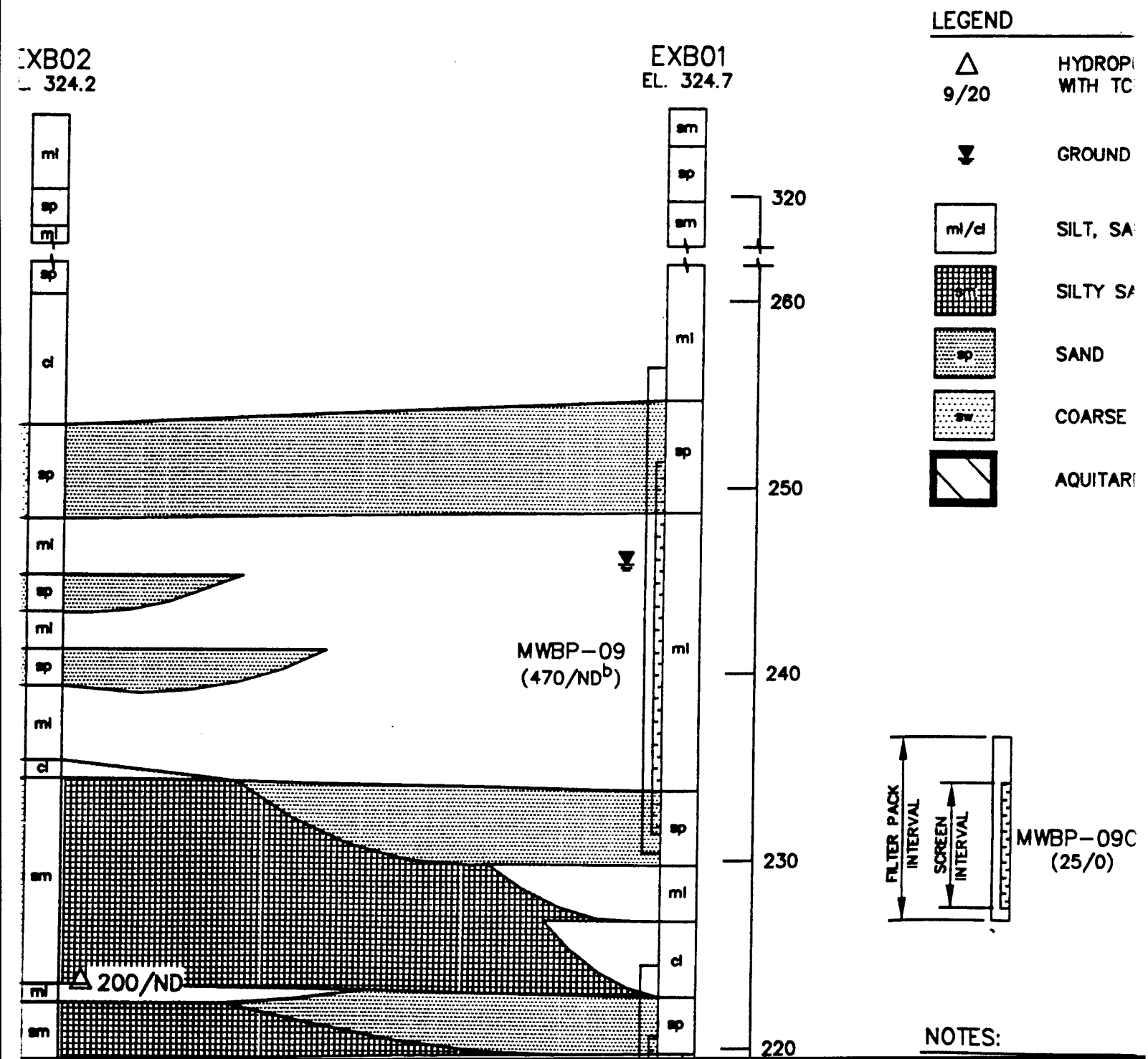


EXB04
EL. 321.1

E
El




EXB03
EL. 323.6
EXB02
EL. 324.2
MW5-01
(10,19b)
Δ9/20
Δ25/10
Δ 200/ND
ml
sp
sm
cl


EXB02
EL. 324.2
EXB01
EL. 324.7
320
260
250
240
230
220
MWBP-09
(470/ND[b])
200/ND
LEGEND
9/20
GROUND
SILT, SA
SILTY SA
SAND
COARSE
AQUITARI
FILTER PACK INTERVAL
SCREEN INTERVAL
MWBP-09C
(25/0)
NOTES:

(5)

HYDROPUNCH GROUNDWATER SCREENING SAMPLE LOCATION
WITH TCE/PCE CONCENTRATION IN PPB

GROUND WATER TABLE ELEVATION, 12/93

SILT, SANDY SILT, CLAY

SILTY SAND

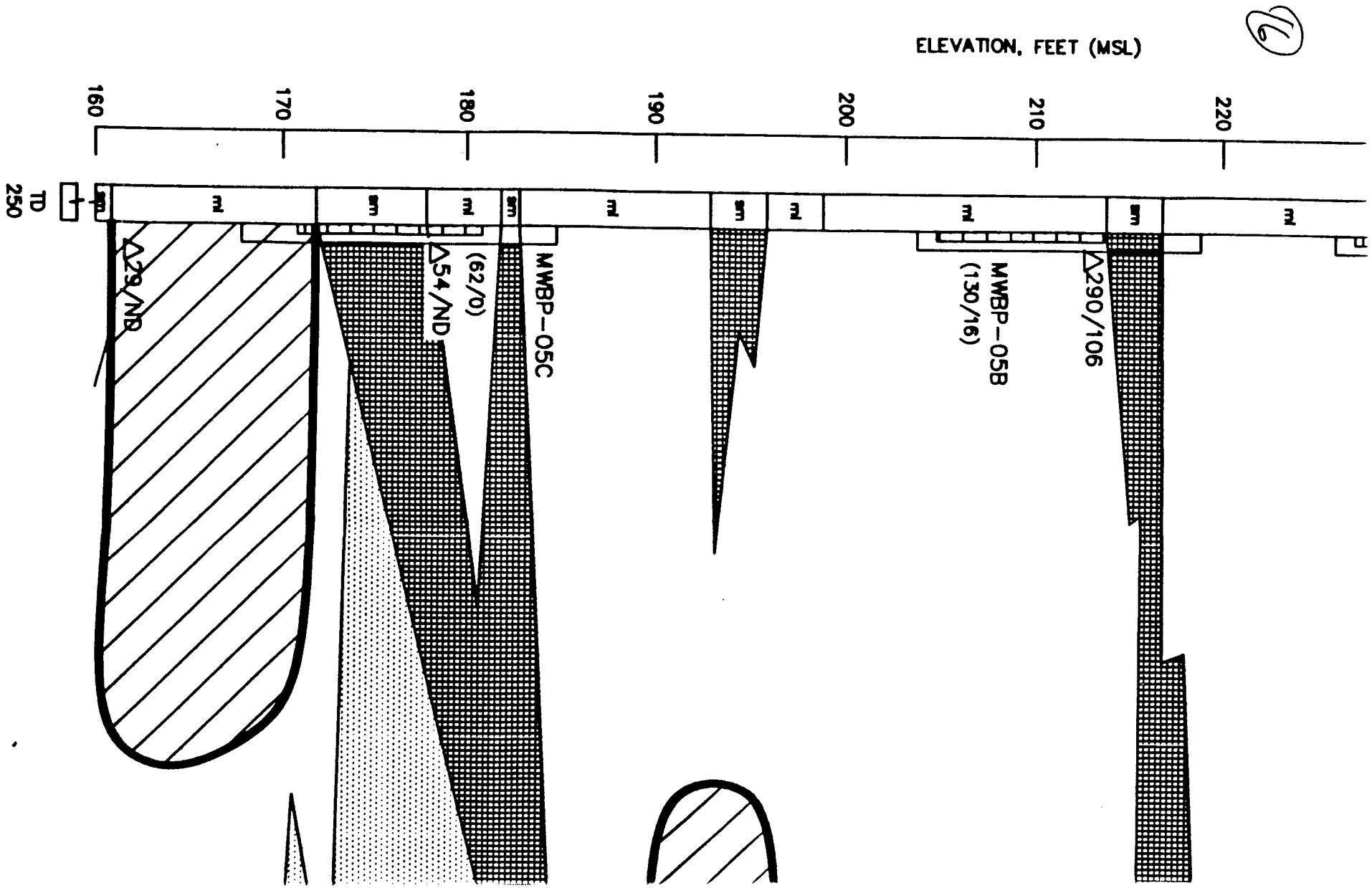
SAND

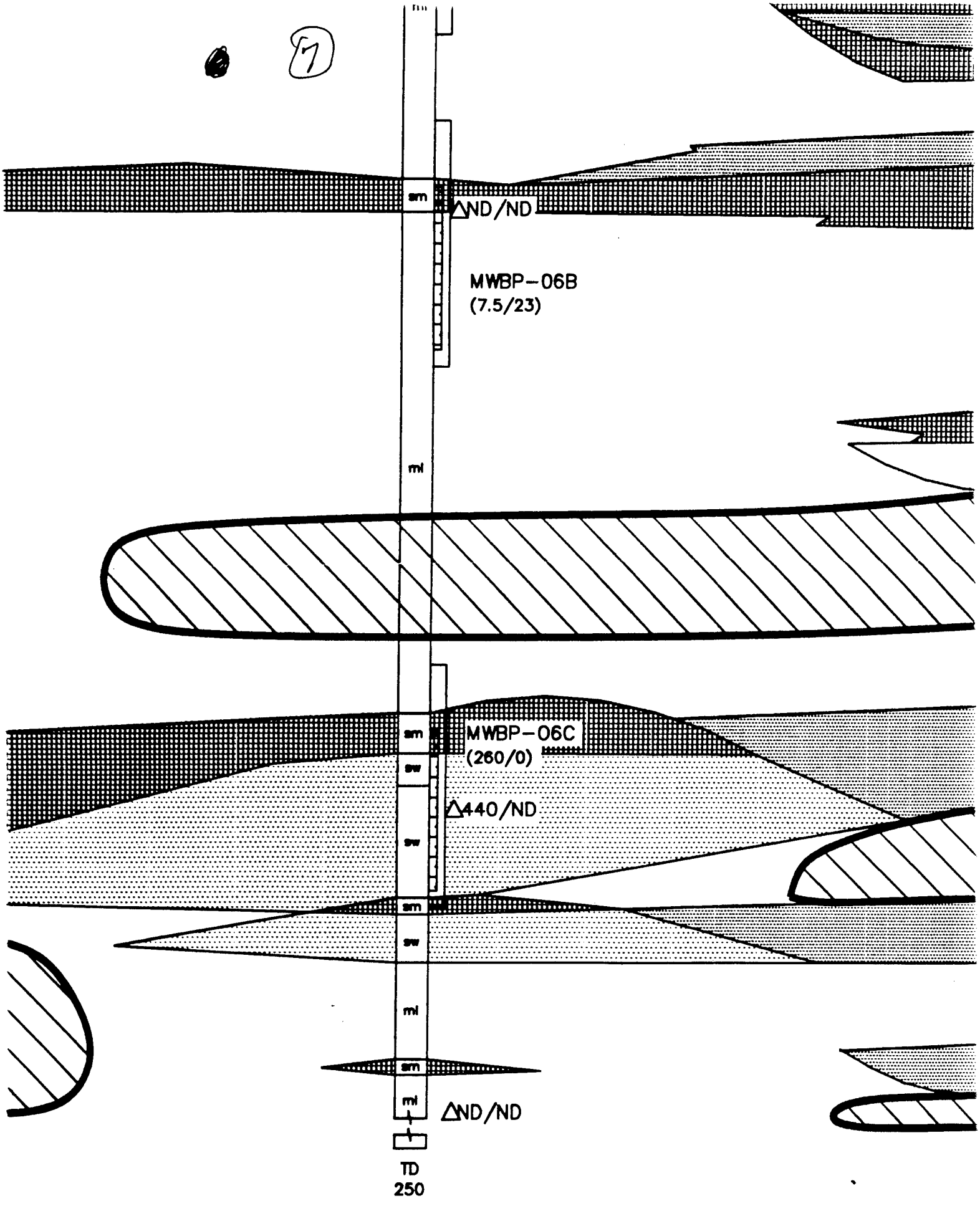
COARSE SAND, GRAVEL

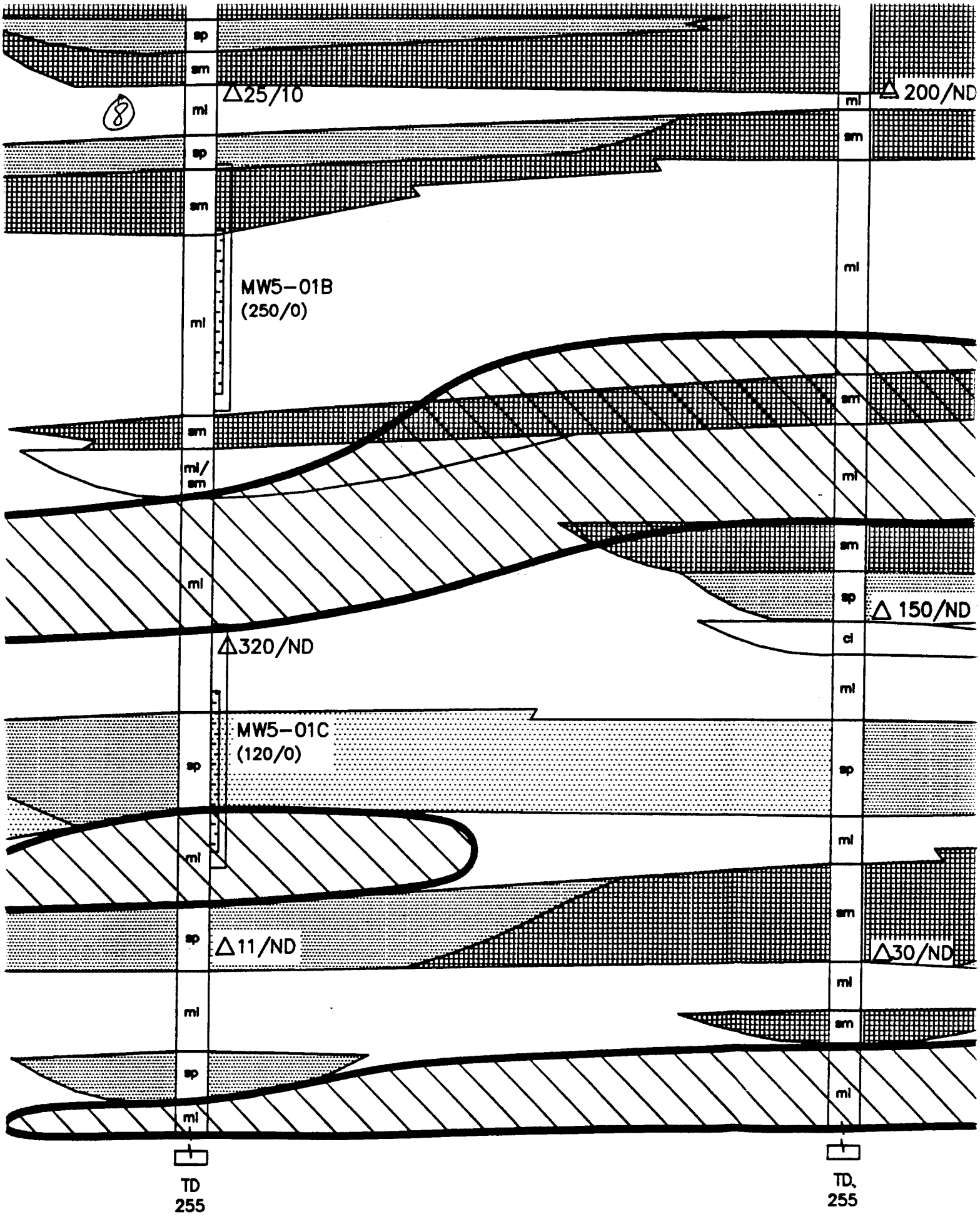
AQUITARD MATERIAL

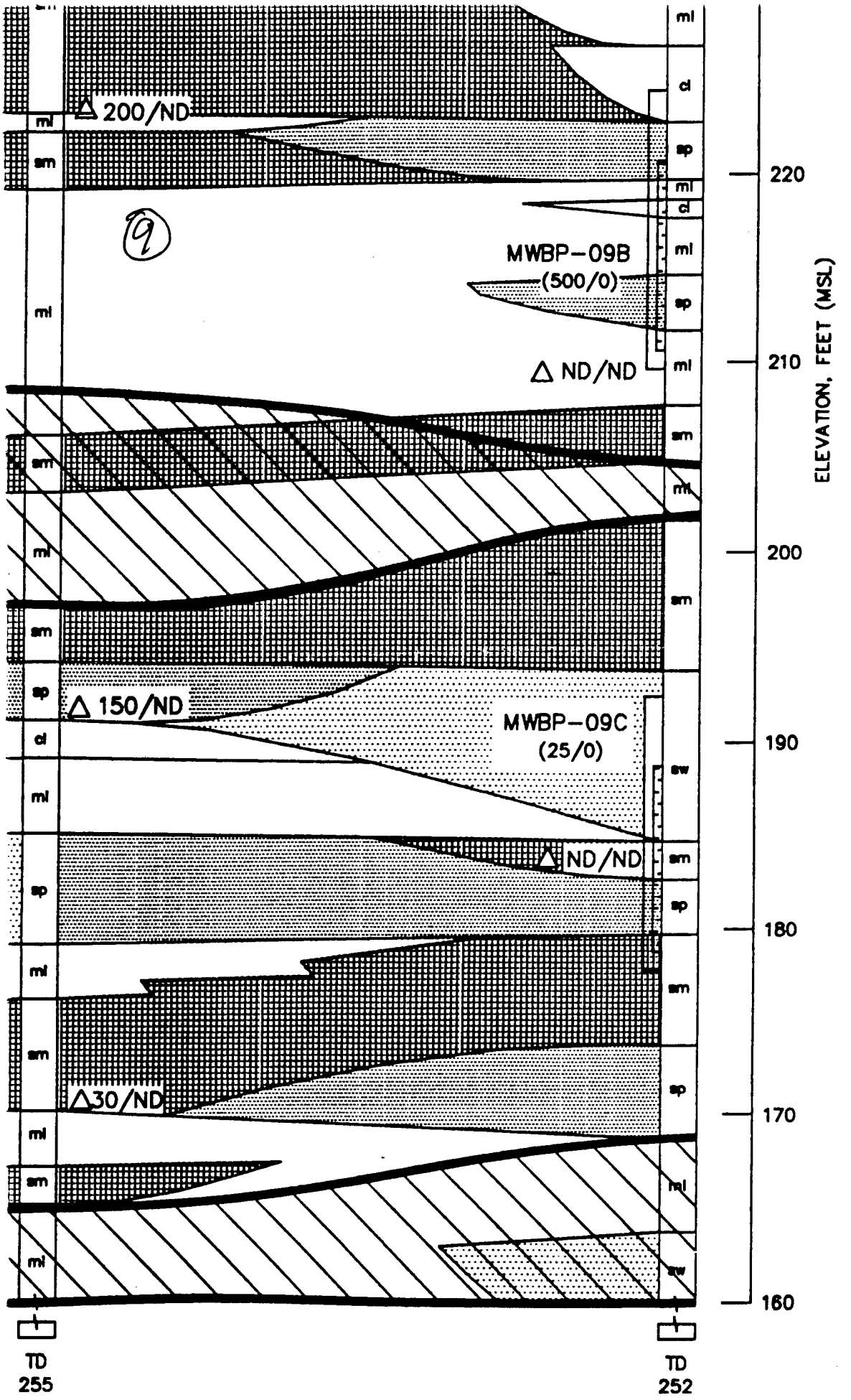
3P-09C WELL NOMENCLATURE WITH TCE/PCE CONCENTRATION
(25/0) IN PPB (WELLS SAMPLED 12/93)

7am DAA	STARTING DATE: 2/28/95	DATE LAST REV.:
	DRAWN BY: D. HIGGS	DRAWN BY:




sm
ND/ND
MWBP-06B
(7.5/23)
ml
sm
MWBP-06C
(260/0)
sw
440/ND
sw
sm
sw
ml
sm
ml
ND/ND
TD
250


sp
sm
ml
Δ25/10
Δ 200/ND
MW5-01B
(250/0)
ml/
sm
Δ320/ND
Δ 150/ND
cl
MW5-01C
(120/0)
Δ11/ND
Δ30/ND
TD
255
TD
255



NOTES:

Δ HYDROF

a AVERAC 11/90

b AVERAC 10/92

HORIZON

0 80

VERTICA

0

VERTICAL EXAG

FIGURE 6

PUMP TE SETTING DATA

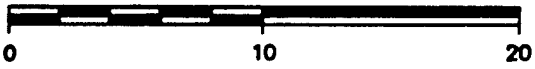
NOTES:

△	HYDROPUNCH SAMPLES COLLECTED 10/93
a	AVERAGE CONCENTRATION OF 6 SAMPLES COLLECTED FROM 11/90 TO 4/93
b	AVERAGE CONCENTRATION OF 3 SAMPLES COLLECTED FROM 10/92 TO 4/93

10

HORIZONTAL SCALE

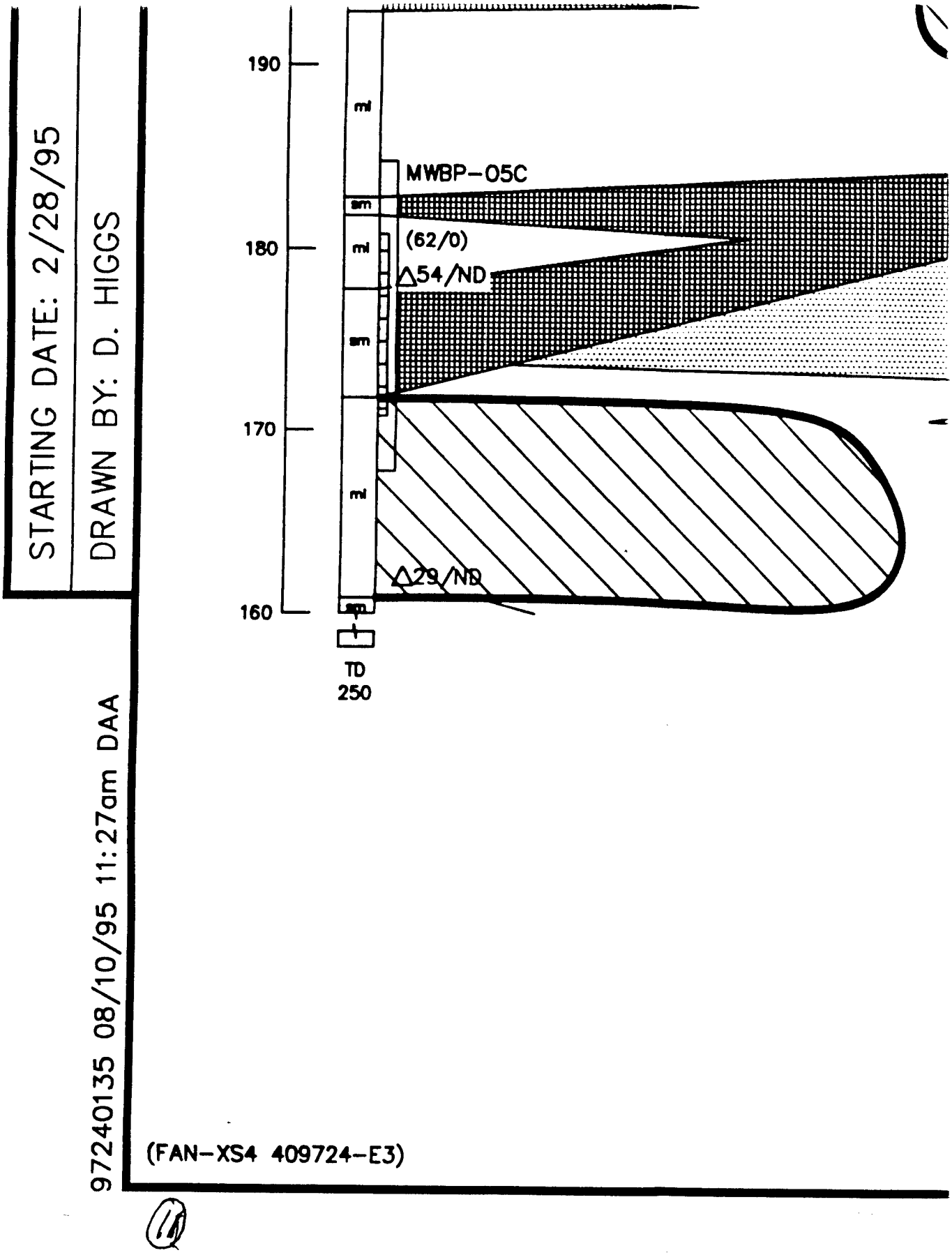
VERTICAL SCALE

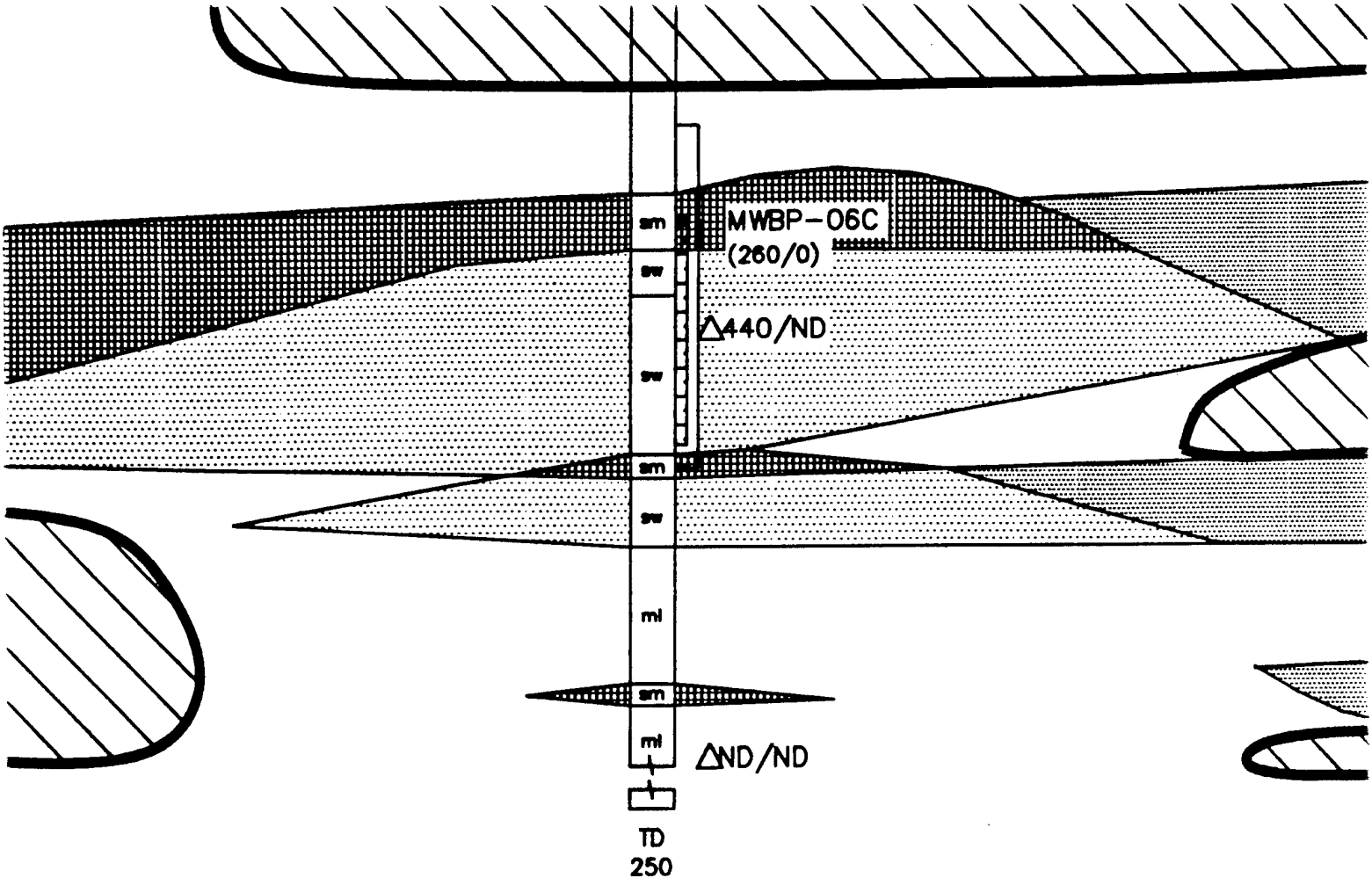


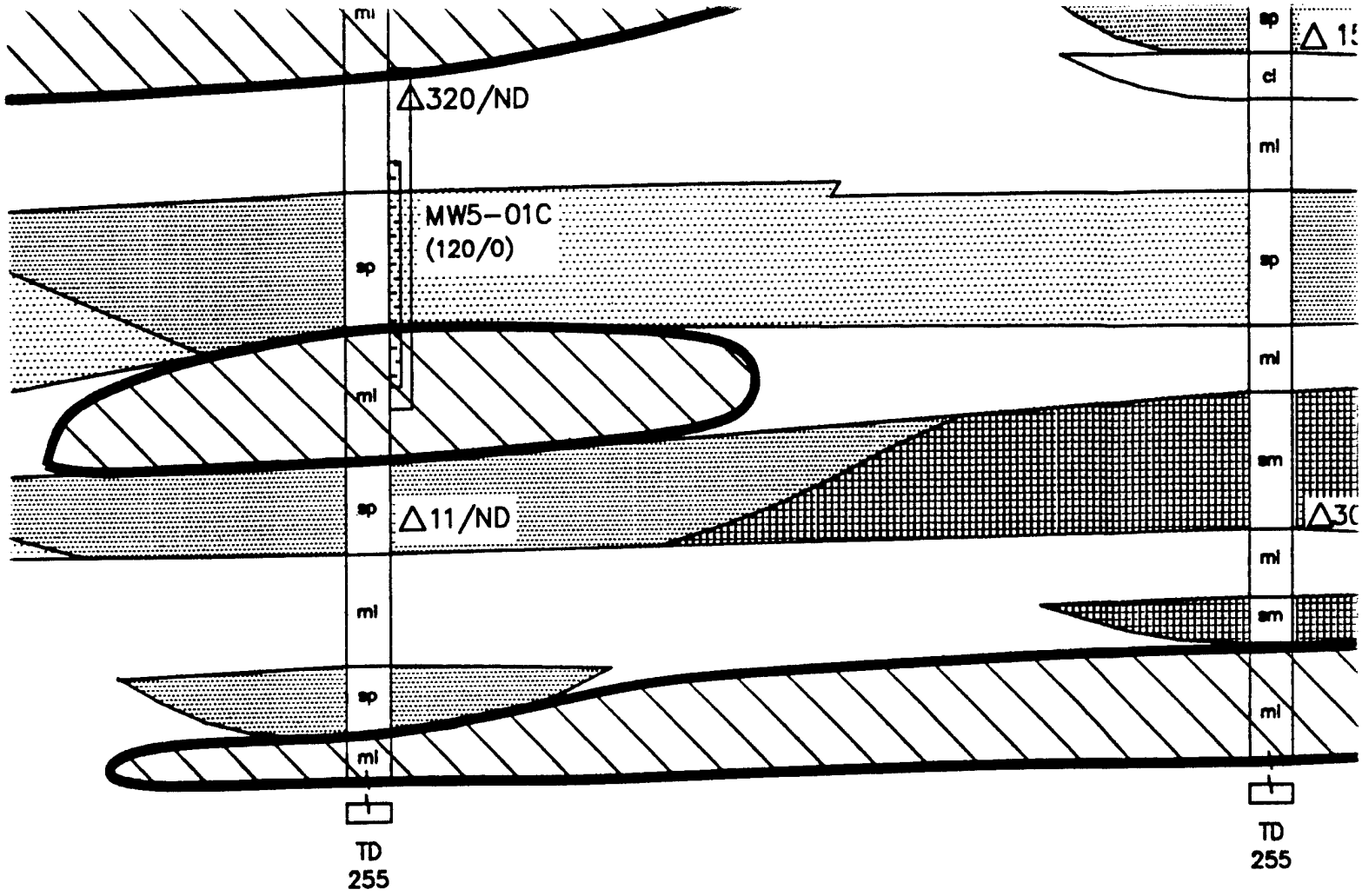
VERTICAL EXAGGERATION = 12X

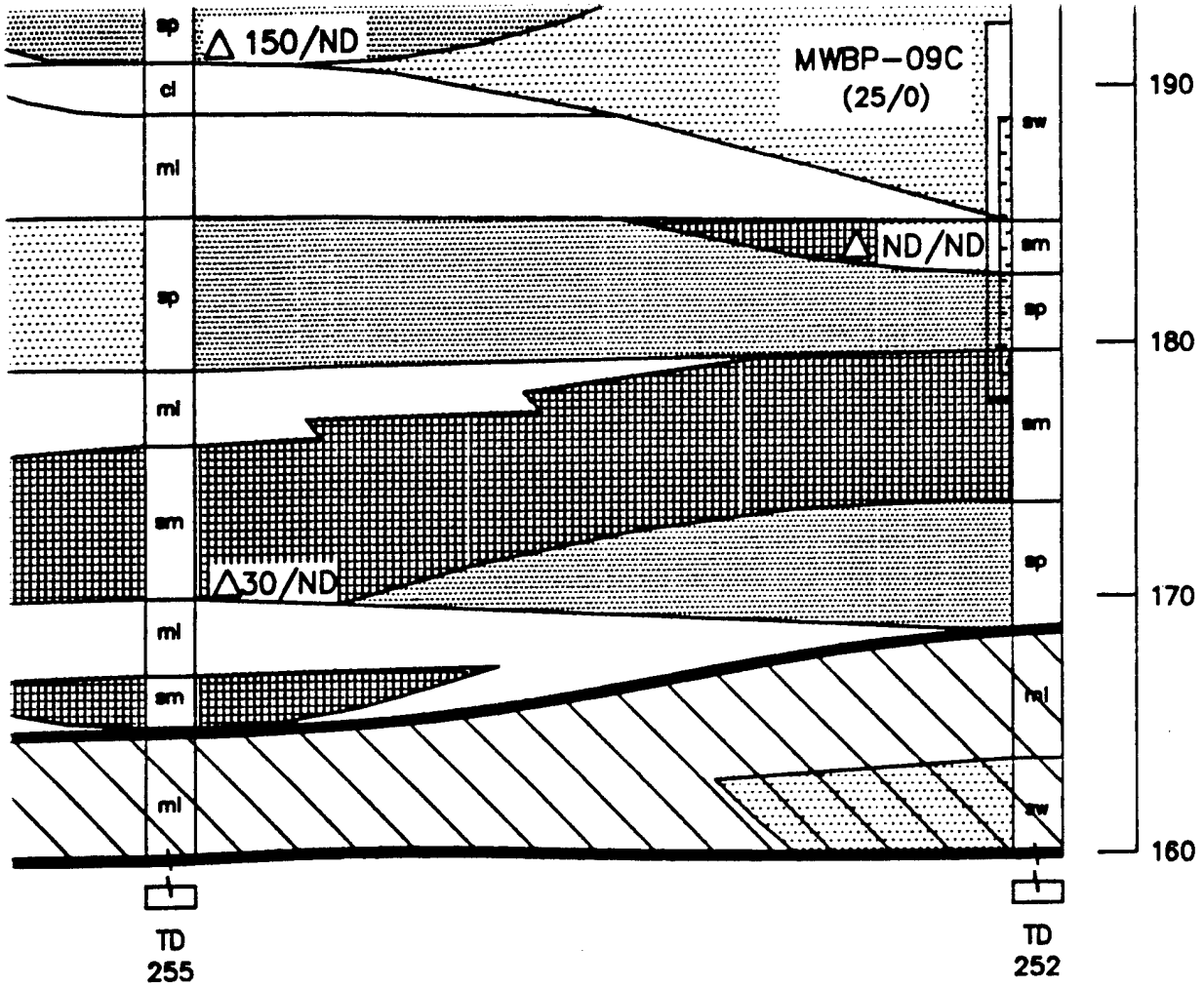
FIGURE 6

PUMP TEST HYDROGEOLOGIC SETTING WITH CHEMICAL DATA


STARTING DATE: 2/28/95
DRAWN BY: D. HIGGS
190
180
170
160
MWBP-05C
(62/0)
Δ54/ND
Δ29/ND
TD
250
97240135 08/10/95 11:27am DAA
(FAN-XS4 409724-E3)


MWBP-06C
(260/0)
Δ440/ND
ΔND/ND
TD
250


ml
Δ320/ND
MW5-01C
(120/0)
sp
ml
sp
Δ11/ND
ml
sp
ml
TD
255
sp
Δ15
cl
ml
sp
ml
sm
Δ30
ml
sm
ml
TD
255



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VER

FIGURE

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DATA

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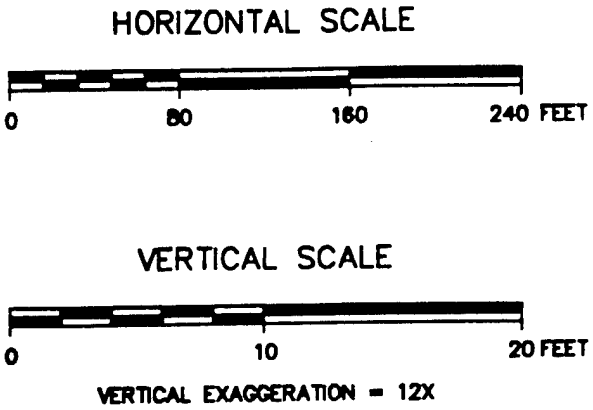

FIGURE 6

PUMP TEST HYDROGEOLOGIC SETTING WITH CHEMICAL DATA

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and "B" zones were essentially equivalent, with 39 percent for the "A" zone and 37 percent for the "B" zone.

4.2.2 Step-Drawdown Tests

The wells in which pump tests were performed were 4- and 5-inch monitoring wells with limited screen lengths. They are not considered production wells, and well efficiency and well loss characteristics were not calculated. Step-drawdown tests were performed in order to assess the practical yield of each well for long-term testing. Summaries of step-drawdown test data are included as Appendix A.

MWBP-12. The step-drawdown test in MWBP-12 was conducted at the flow rates listed in Table 2. Figure 7 displays the drawdown measurements for the test duration. Initially, the water column standing in MWBP-12 was 11.9 feet and by the end of the test drawdown approached 50 per cent of this height at a pumping rate of 7 gpm. Approximately 0.6 feet of drawdown was recorded in observation well P-1 at the end of the test (Appendix A).

Given the type of material in which MWBP-12 was installed (silty sands), the initial water column height, and the total pumping lift, the well was pumped at a rate greater than that which was originally expected. The pump was lifting water through a 1-inch discharge line to the carbon filtration system to the top of the temporary holding tank, causing additional head loss. With this amount of head loss, the pump was at its maximum rate at 7 gpm. It was theorized that if the size of the discharge line were increased and the total lift of the pump reduced, then a greater pump rate could be achieved for the long-term test. For these reasons, a rate of 7.5 gpm was set for the long-term test.

MWBP-05B. Drawdown measurements for the step-drawdown test in MWBP-05B are shown in Figure 8. Observation well data from piezometers P-3B and P-4A are shown in Figure 9.

The first objective of the aquifer testing program was to determine if the "A" and "B" zones are in hydraulic communication. This objective was met with the step-drawdown test. As seen in Figure 9, the piezometer installed in the shallower sediments responds to the pumping in the lower sediments almost instantaneously. The hypothesis that the "A" and "B" zones are part of a single aquifer appears to be correct at this particular location.

Based on the response of MWBP-05B during the step-drawdown test, a pumping rate of 16 gpm was selected for the long-term test.

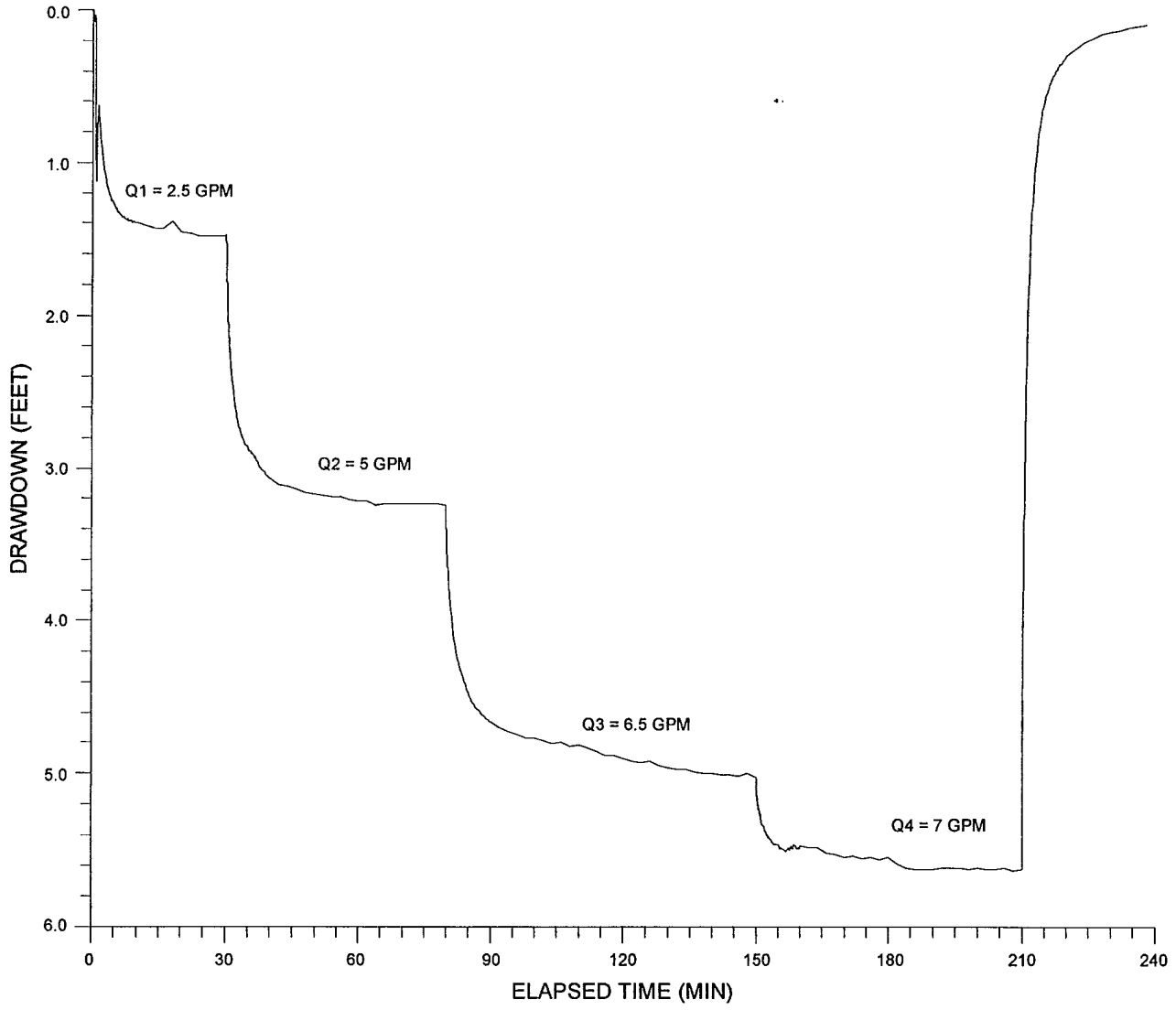

FIGURE 7

STEP-DRAWDOWN TEST RESULTS IN MWBP-12

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c:\fi4\fang\gsbp5b.drw/sai/11-12-96

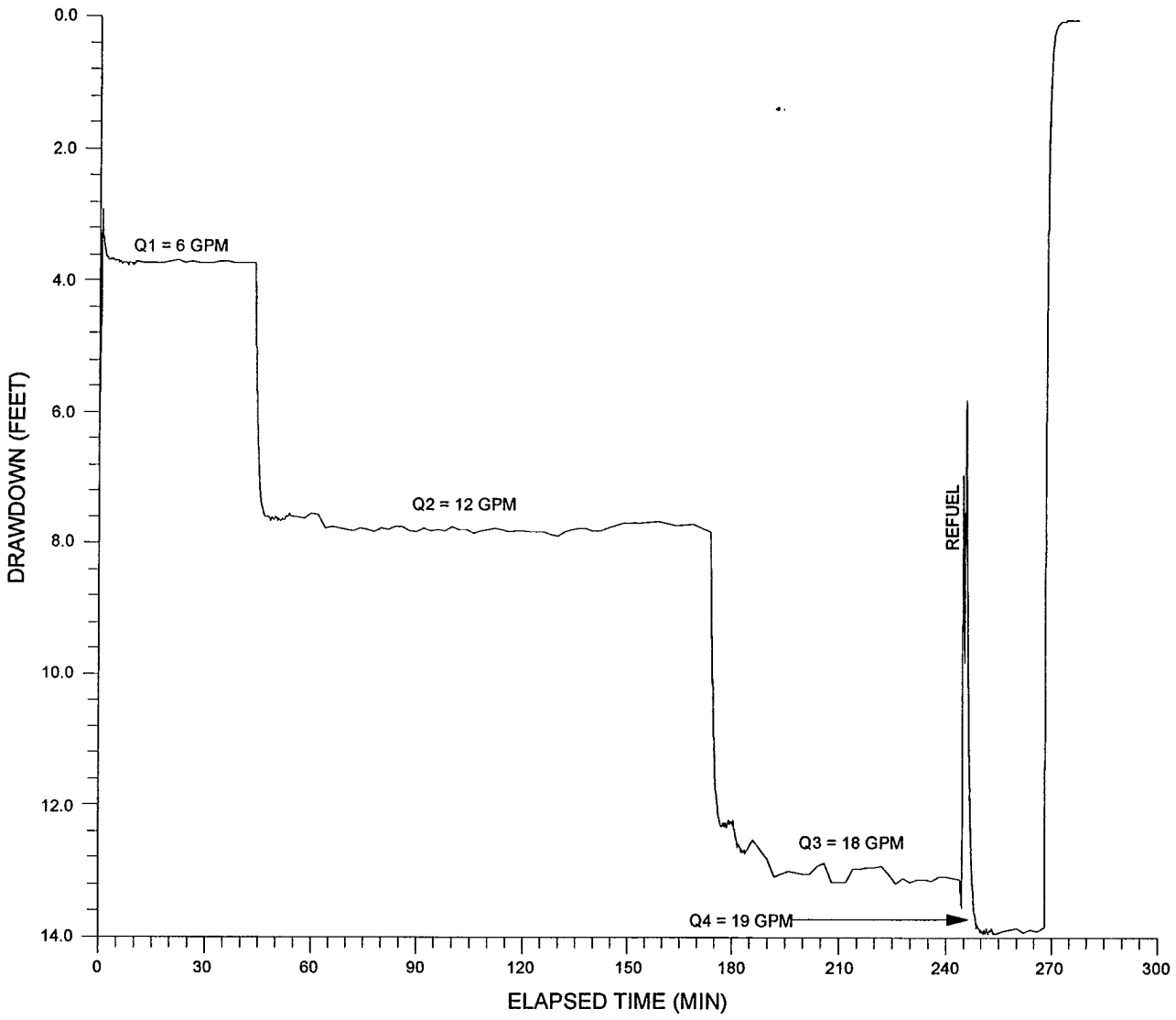

FIGURE 8

STEP-DRAWDOWN TEST RESULTS IN MWBP-05B

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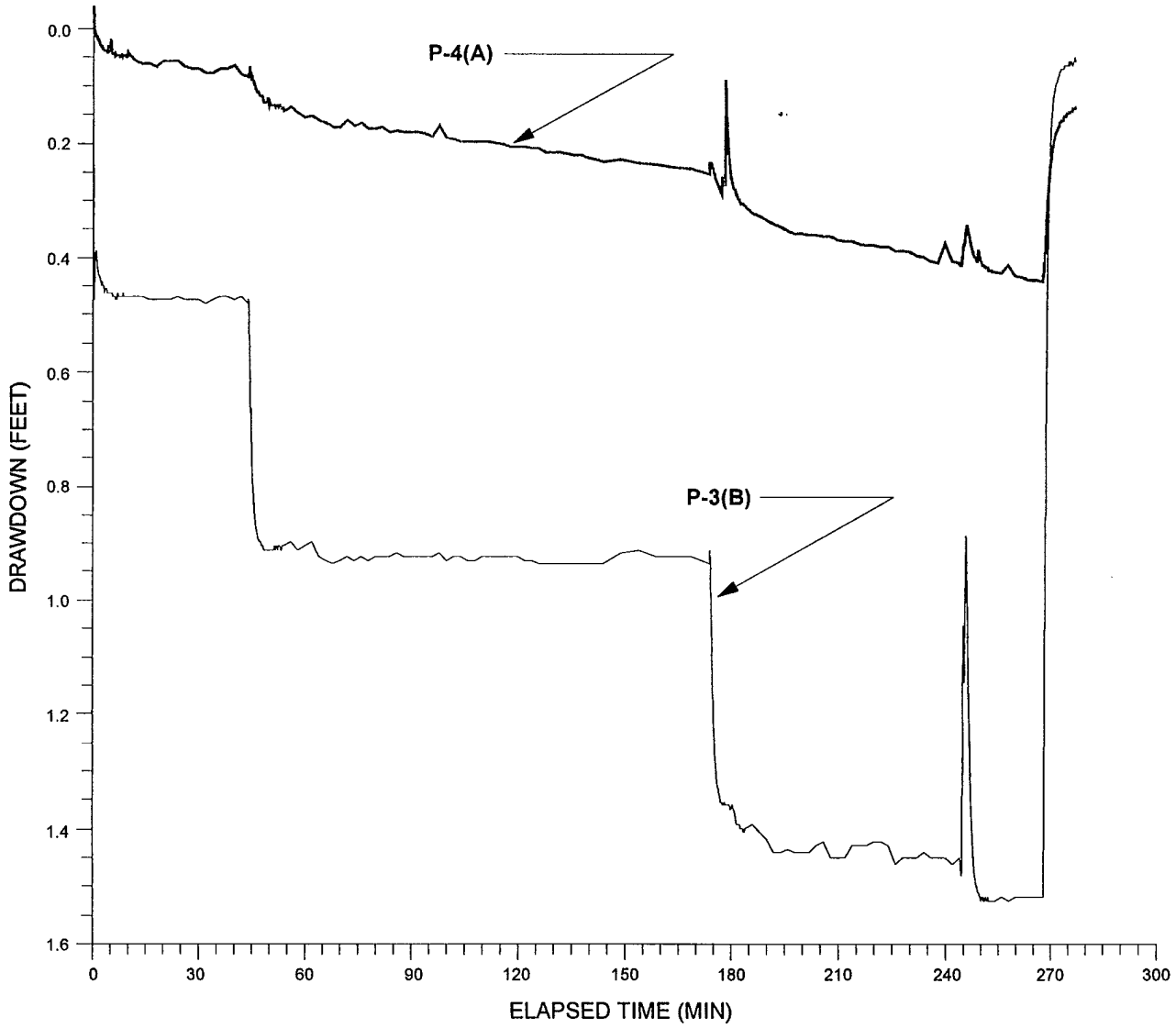

NOTES:

P-3(B) SCREENED AT SAME DEPTH INTERVAL AS MWBP-05B

P-4(A) SCREENED ACROSS THE WATER TABLE

FIGURE 9

DRAWDOWN MEASUREMENTS IN P-3(B) AND P-4(A) DURING STEP-DRAWDOWN TEST IN MWBP-05B

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Recovery Analysis. A method for determining transmissivity from the recovery data after a step-drawdown or variable rate pump test has been developed by Kawecki (1993). Equations developed by Kawecki are based on the Theis recovery method, and if the pump test has only one pumping stage followed by recovery, then Kawecki's method reduces to the Theis recovery method. The analysis method, equations, graphs, and recovery data are included in Appendix A. From this analysis, a transmissivity value for the "A" and "B" zones was calculated to be 89 square feet per day (ft^2/day) and 62 ft^2/day, respectively.

4.2.3 Long-Term Tests

Constant rate aquifer tests were conducted in MWBP-12 and MWBP-05B. Discharge rates were measured by a direct-read flow meter and were maintained through adjustments in the pump controller. Drawdown measurements were collected in the pumping well and nearby observation points with both pressure transducers and manual measurements. All data has been adjusted based on ambient background readings. The adjusted data are presented. Constant rate test data and analysis summaries are included in Appendix B.

Aquifer parameter estimates will be presented in the following manner. First, observations from each test will be described, then responses to pumping from the pumping well and each observation well will be addressed. The characteristic of the response curves will be discussed as to the type of aquifer model (unconfined, confined, or semi-confined) that best represents observed data patterns for each well. Numerical aquifer parameter estimates are summarized in a table; this is followed by a general synthesis of aquifer property values. Only the parameter estimates calculated for the pumping phases are used to determine average aquifer property values. Values derived from recovery phases are used only as a secondary check on the averaged aquifer properties.

4.2.3.1 Pumping Test Results at MWBP-12

The constant rate test in MWBP-12 was conducted at a flow rate of 7.5 gpm. It was originally scheduled to be conducted for 36 hours; however, due to excessive drawdown, it was stopped after a period of 20 hours. A graph of drawdown versus elapsed test time for MWBP-12 is shown in Figure 10. The initial two breaks in the graph (in the first 10 minutes) were caused by flow rate adjustments. After 10 minutes, the small jumps in the drawdown curve are believed to be caused by successively draining thin permeable layers near to the pumping well. This is consistent with the conceptual model for the composition of the aquifer in that it comprises multiple layers and lenses of permeable material interspersed among thicker, more extensive fine-grained beds. In addition, some jumps in the drawdown curve may have occurred because

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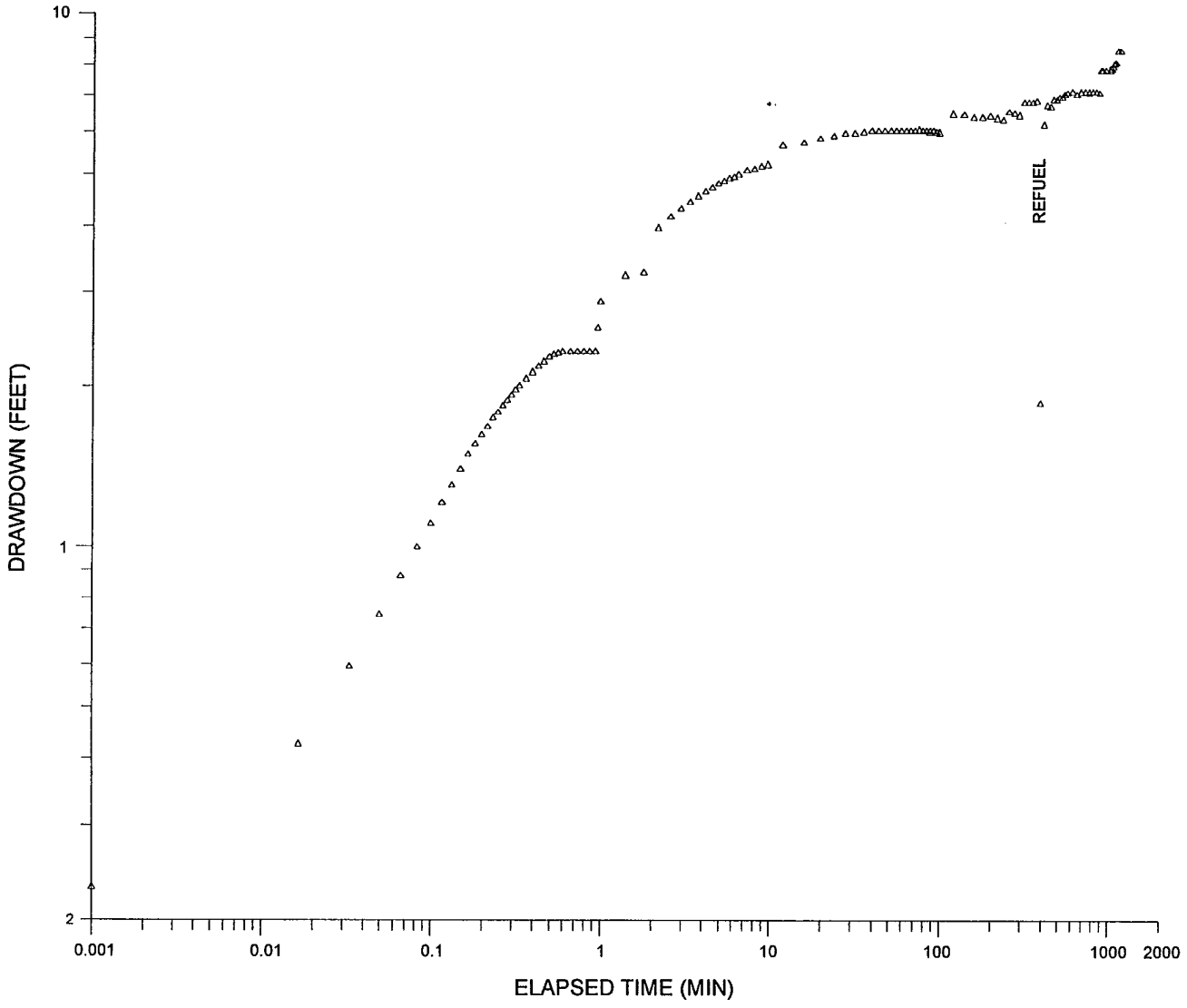

NOTES:

PUMPING RATE IN MWBP-12 IS 7.5 GPM

FIGURE 10
CONSTANT RATE TEST RESULTS IN MWBP-12

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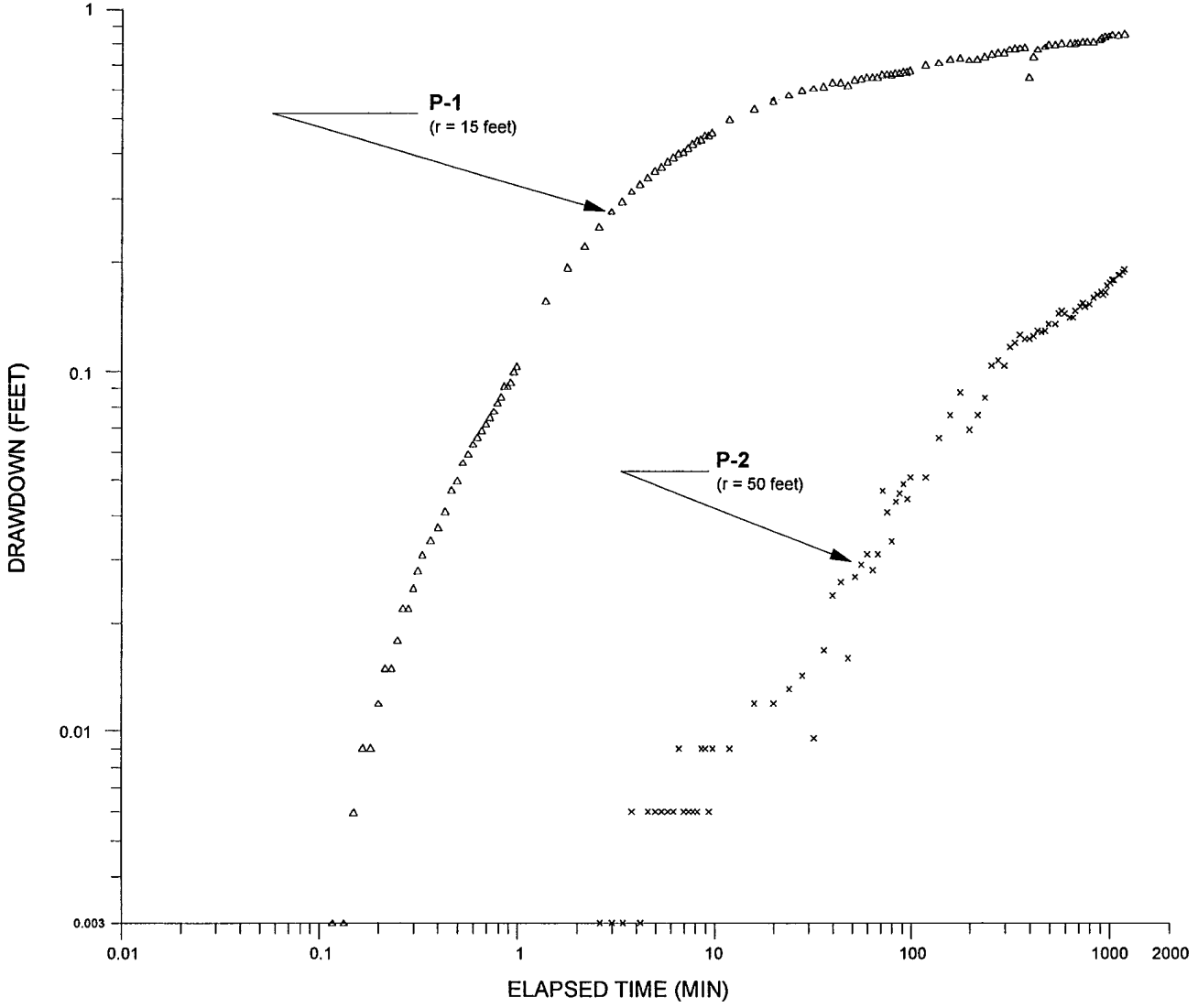
the data for individual wells has been adjusted based on ambient fluctuations observed at the background monitoring well. Heterogeneities in the subsurface could mean that whereas the observed ambient fluctuations are generally applicable, they may not represent accurately the actual fluctuations due to "natural" causes at the wells monitored for the long-term pumping tests.

Figure 10 shows that drawdown in MWBP-12 begins to increase more rapidly after about 1,000 minutes. Total drawdown at the end of the test was 8.6 feet; only 12 feet of water was available within the well and this amount of drawdown neared the level of the pump. The aquifer was essentially dewatered. Due to the shorter length of time that the test was run, it is unknown whether or not the flatter portion of the curve between 10 and 1,000 minutes was due to delayed yield effects similar to the response of a typical unconfined aquifer or whether the aquifer was simply dewatered. Because of the relatively thin cone of depression available to contribute water from gravity drainage, it is unlikely that delayed yield effects occurred.

A graph of the drawdown in observation points P-1 and P-2 is shown in Figure 11. Total drawdown for P-1 (15 feet from MWBP-12) at the end of the test was 0.86 feet, and for P-2 (50 feet from MWBP-12), 0.19 feet (Appendix B). No drawdown was observed at MW2-02, located 130 feet from MWBP-12. The radius of influence is likely approximately 75 feet from the pumping well.

Analysis of MWBP-12 Time-Drawdown Data. Limited analytical methods are available for determining a transmissivity (T) value from pumping wells. Various type-curves were tested for fit against the time-drawdown data for the pumping portion of the test plotted on a log-log scale. The best fit was obtained by one of the Papadopulos-Cooper (1967) type curves. The Papadopulos-Cooper method is more applicable to large-diameter wells with significant well-bore storage; however, application is useful after larger pumping times such that the effects of storage are diminished. This method was used to calculate T but the calculated value of S was not taken as representative because S can not be calculated from pumping well data. Time-drawdown data plotted on a semi-log scale was analyzed using the Jacob straight line method (Kruseman and deRidder, 1990). Late time data only was used because this is likely representative of the formation only (no well-bore storage). The recovery data was analyzed using the Theis recovery method (Kruseman and deRidder, 1990). Although storage values for some of the methods were calculated by the computer program used for test analysis, the storage value is meaningless for the pumping well and no storage values are presented here. Table 4 lists the



NOTES:

PUMPING RATE IN MWBP-12 IS 7.5 GPM

DRAWDOWNS HAVE BEEN CORRECTED FOR BACKGROUND FLUCTUATIONS

FIGURE 11

DRAWDOWN MEASUREMENTS IN P-1 AND P-2 DURING CONSTANT RATE TEST IN MWBP-12

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Table 4

Aquifer Test Analysis Summary
California Air National Guard, Fresno, California

Pumping Well ID	Observation Well ID	Analytical Model	Model Type	Data Set	Transmissivity, T (ft^2/day)	Storativity	Average T[b] (ft^2/day)
MWBP-12	MWBP-12	P-Cooper[a] Jacob straight line Theis recovery Kawecki	Confined, large diameter well Confined Confined Confined/unconfined	Drawdown Drawdown, late time data Recovery Step-drawdown recovery	168 328 60 89		250
	P-1	Theis Theis recovery	Confined Confined	Drawdown Recovery	703 619	.0033	700
	P-2	Theis Theis recovery	Confined Confined	Drawdown Recovery	2206 5818	.063	2200
	P-1/P-2	Thiem-Dupuit	Confined/unconfined	Distance-drawdown	420		420
MWBP-05B	MWBP-05B	P-Cooper Jacob straight line Theis recovery Kawecki	Confined, large diameter well Confined Confined Confined/unconfined	Drawdown Drawdown, late time data Recovery Step-drawdown recovery	359 1811 68 62		1085
	P-3B	Hantush-Jacob Walton Hantush modification Theis recovery	Leaky confined Leaky confined Confined, partial penetration Confined	Drawdown Drawdown Drawdown Recovery	846 931 294 533	.0002 .0002	740
	P-5B	Jacob straight line Theis Theis recovery	Confined Confined Confined	Drawdown, late time data Drawdown Recovery	5653 5176 9893	.0002 .0002	5415
	P-3B/P-5B	Theim-Dupuit	Confined	Distance-drawdown	650		650
	P-4A	Theis Theis recovery	Confined Confined	Drawdown Recovery	2414 4147	.004	2410
	MWBP-05	Theis Theis recovery	Confined Confined	Drawdown Recovery	2414 6896	.024	2410
	P-4A/MWBP-05	Thiem-Dupuit	Confined	Distance-drawdown	1410		1400

[a]Papadopulos-Cooper.
[b]T values calculated from recovery data are not used to calculate an average T.

calculated T values for the various analytical methods. Results of the step-drawdown test recovery analysis are also included in Table 4 for completeness.

Recovery analyses are provided in Appendix B. On each recovery graph, a value for S' is given by the computer program. S' is defined as the ratio of storativity values during the pumping phase (S) and recovery phase (S"), or S' = S/S". However, dissecting the analyses to determine and fully assess various S values for different portions of the tests was seen to provide information of little importance in relation to the length of the tests and ultimate use of this data.

Analysis of P-1 Time-Drawdown Data. Time-drawdown data for P-1 is shown in Figure 11. When plotted with the Theis curve (Appendix B), the time-drawdown data for P-1 shows that the data departs below the Theis curve (i.e., there is less drawdown than expected from the model) beyond approximately 40 minutes. This indicates either leakage effects or delayed yield. For the types of sediments being tested (silty sands), delayed yield effects would have been typically expected between 10 and 100 minutes of pumping (Dawson and Istok, 1991). However, because the aquifer was over-stressed, no completion of delayed yield effects was observable such that the data did not fit any of the Neuman (1972) or Boulton (1954) type curves for unconfined aquifers. Consequently, the early time time-drawdown data were analyzed by the Theis method for confined aquifers, which best matched the data set. T and S were determined as indicated in Table 4. The Theis recovery method was applied to the recovery data for P-1 for further estimation of T.

Analysis of P-2 Time-Drawdown Data. The time drawdown curve for P-2 (Figure 11) shows that the test was not run long enough for sufficient development of a curve for confident analysis of delayed yield or partial penetration effects. Consequently, the Theis curve for confined conditions was applied. Since the data is for the initial portions of the drawdown curve and actual drawdown was very small, little confidence is given to the resulting T and S values calculated.

Analysis of Distance-Drawdown Data. The Thiem-Dupuit (Kruseman and de Ridder, 1990) analysis, for distance-drawdown analysis, was performed for the final drawdowns measured in P-1 and P-2. It is understood that the Thiem-Dupuit method is a steady-state analysis, although as the rate of change of drawdown with time becomes smaller (i.e., as steady state is approached), this method becomes more applicable. A resulting T value of 420 ft^2/day was calculated, and this value is within the reasonable range reported from P-1 and MWBP-12 (Table 4).

Synthesis of Results of Aquifer Test at MWBP-12. Table 4 lists the calculated T and S values for the data collected during testing of MWBP-12. An average value for T in MWBP-12 and P-1 is 250 and 700 ft^2/day, respectively. This range is believed to be representative of the aquifer material at this location. The lower values of 89 ft^2/day and 60 ft^2/day calculated from the recovery data from the pumping well is likely representative of the material in the immediate vicinity of the screen, but higher values calculated from the drawdown portion of the test for both the pumped well and the observation well P-1 indicate that the higher values are perhaps more indicative of long-term yield capabilities of the shallow sediments. An average transmissivity was not calculated from the response in P-2 because of the reasons presented above. This higher value is due to the pumping rate (7.5 gpm) being applied where drawdown was only 0.2 feet. Given a representative T value of 700 ft^2/day, the drawdown at P-2 should have been closer to 0.9 feet (as opposed to 0.2 feet of measured drawdown), suggesting that additional recharge was occurring from an outside source, possibly from an adjacent sand bed of high permeability.

Storativity for the aquifer, obtained from the analysis at P-1, is 0.003 (Table 4). This value indicates that the amount of water released from storage is more akin to a confined aquifer than to an unconfined aquifer.

Table 5 shows the calculated and representative average T, hydraulic conductivity (K), and S values obtained from analysis of data from the aquifer test at MWBP-12. A more detailed discussion of K is included at the end of the following section.

4.2.3.2 Pumping Test Results at MWBP-05B

The constant rate test in MWBP-05B was conducted at a flow rate of 16 gpm for a period of 36 hours. A graph of drawdown versus elapsed time for MWBP-05B is shown in Figure 12. A jump of approximately 0.9 feet of drawdown is noted between 10 and 12 minutes. As in the test in MWBP-12, this was interpreted to be caused by a successive draining of thin permeable layers near to the pumping well within the cone of depression. Figure 13 shows the response of observation points P-3B and P-4A during the constant rate test. A similar break in the drawdown is noted in P-3B, but not in P-4A, indicating that the dewatered layer was at a depth similar to the pumping well. Total drawdown in P-3B and P-4A at the end of the test were 1.5 and 0.7 feet, respectively (Appendix B).

Figure 14 provides drawdown graphs for observation points P-5B and MWBP-05, which are further from MWBP-05B than P-3B and P-4A. Total drawdown in P-5B and MWBP-05 at the end of the test were 0.3 and 0.4 feet, respectively. The slightly smaller drawdown in P-5B, which

Table 5

Calculated Average Properties
California Air National Guard, Fresno, California

Location/Zone	Test Wells	T (ft^2/day)	S	
MWBP-12/Shallow Sediments	MWBP-12	250		
	P-1	700	0.003	b^b = 45 ft
	P-2[a]	Not used		K^b = T/b = 10.2 ft/day
	Thiem-Dupuit	420		
	Average T, S	460	0.003	
MWBP-05B/Deeper Sediments				
	MWBP-05B	1085		
	P-3B	740	0.0002	
	P-5B[c]	Not used		Average of entire section:
	Thiem-Dupuit	650		T = 1450 ft^2/day
	Average T, S	825	0.0002	S = 0.007
MWBP-05B/Shallow Sediments				
	P-4A	2410	0.004	b = 45 ft
	MWBP-05	2410	0.024	K = T/b = 32 ft/day
	Thiem-Dupuit	1400		
	Average T, S	2070	0.014	

[a]P-2 not used due to very small drawdown and unreasonably high T values.
[b]b = aquifer thickness
K = hydraulic conductivity
[c]P-5B not used due to erratic data pattern and unreasonably high T values.

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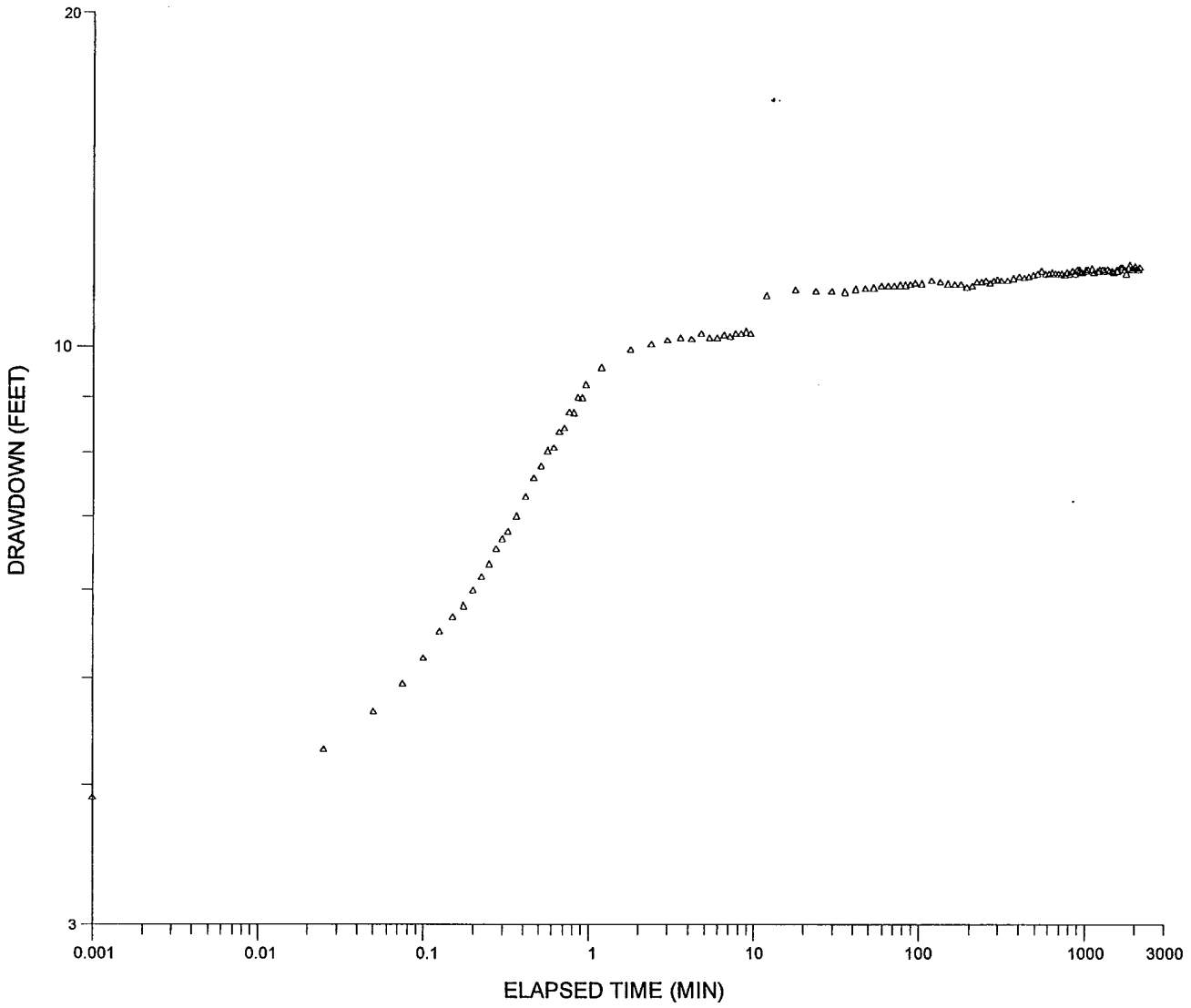

NOTES:

PUMPING RATE IN MWBP-05B IS 16 GPM

FIGURE 12
CONSTANT RATE TEST RESULTS IN MWBP-05B

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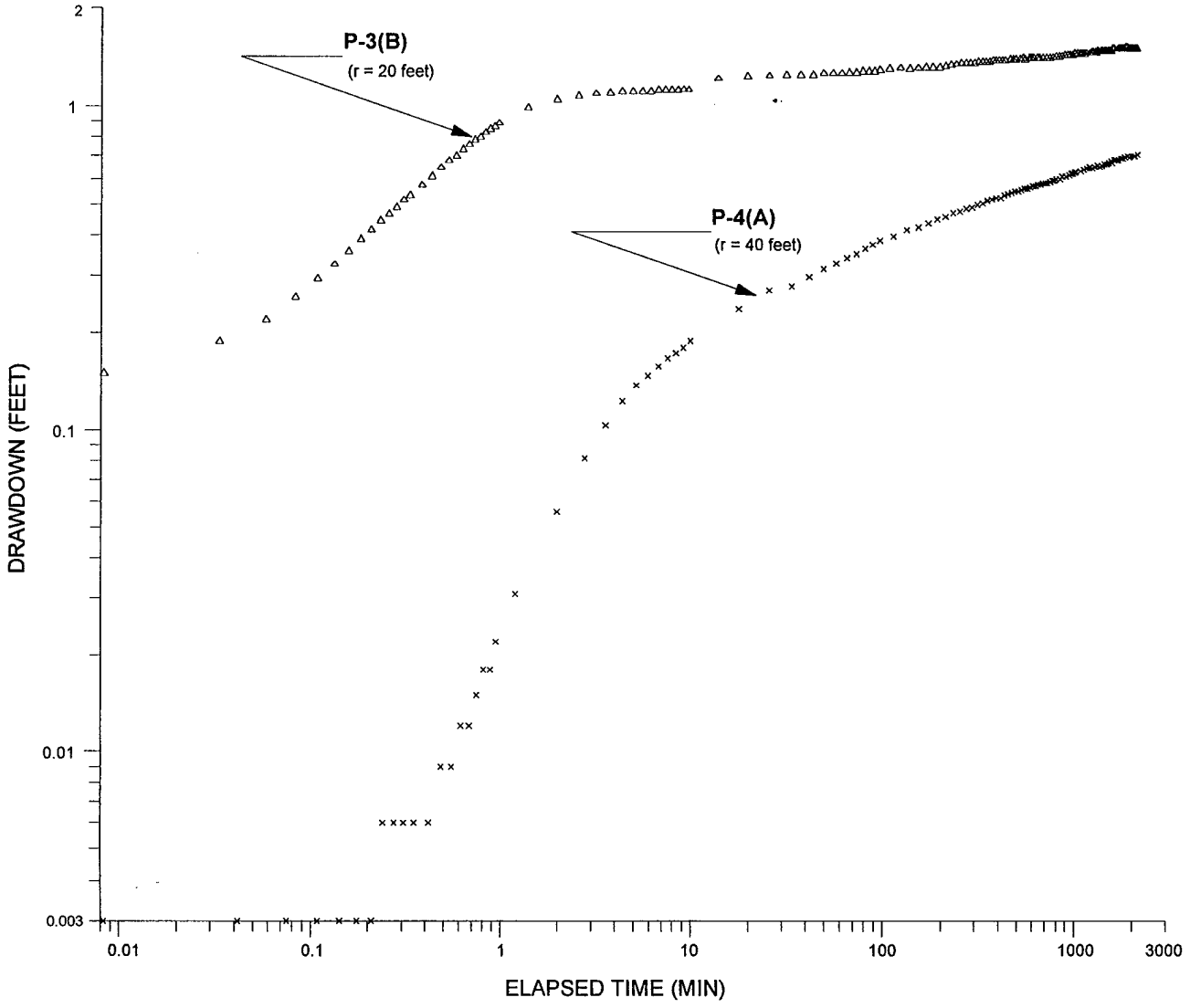

NOTES:

P-3(B) SCREENED AT SAME DEPTH INTERVAL AS MWBP-05B

P-4(A) SCREENED ACROSS THE WATER TABLE

PUMPING RATE IN MWBP-05B IS 16 GPM

DRAWDOWNS HAVE BEEN CORRECTED FOR BACKGROUND FLUCTUATIONS

FIGURE 13

DRAWDOWN MEASUREMENTS IN P-3(B) AND P-4(A) DURING CONSANT RATE TEST IN MWBP-05B

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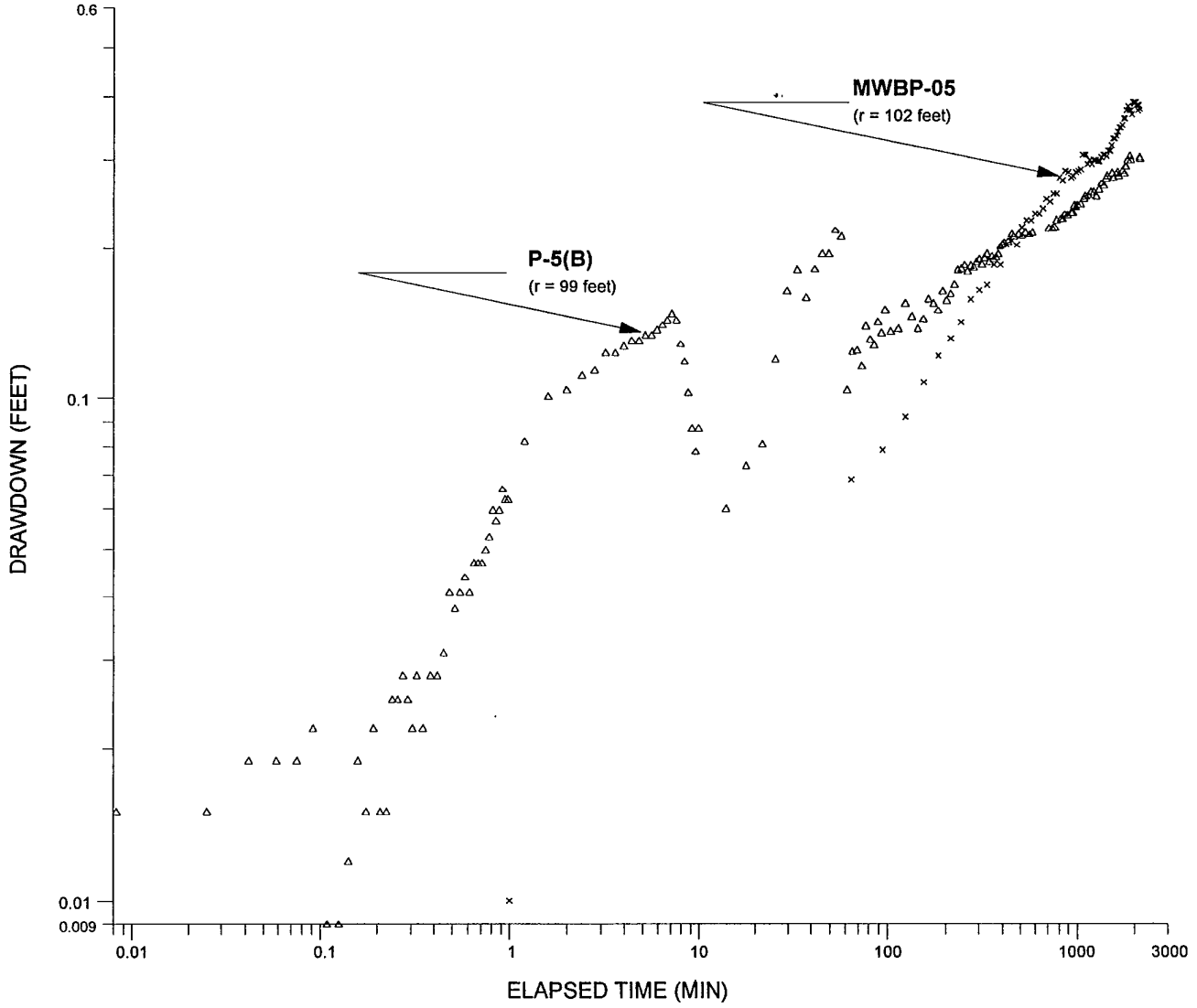

NOTES:

P-5(B) SCREENED AT SAME DEPTH INTERVAL AS MWBP-05B

MWBP-05 SCREENED ACROSS THE WATER TABLE

PUMPING RATE IN MWBP-05B IS 16 GPM

DRAWDOWNS HAVE BEEN CORRECTED FOR BACKGROUND FLUCTUATIONS

FIGURE 14

DRAWDOWN MEASUREMENTS IN P-5(B) AND MWBP-05 DURING CONSTANT RATE TEST IN MWBP-05B

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is screened at the same depth interval as the pumping well, suggests that leakage was induced from overlying sediments.

Analysis of MWBP-05B Time-Drawdown Data. Drawdown data for the constant rate test are presented in Figure 12. As with MWBP-12, the Theis recovery, Papadopulos-Cooper (for large diameter wells) and Jacob straight line methods were applied to the pumping well MWBP-05B. Early time data were fit to the Papadopulos-Cooper curve whereas the Jacob method was applied to the late time data. Analysis by the Papadopulos-Cooper method more likely characterizes the sediments at the screened portion of the aquifer. These sediments comprise predominantly silts and sandy silts (Figure 6). Late-time data analysis would be expected to be more representative of the entire aquifer within the radius of influence since at later times leakage effects appear to have been induced. The late-time data would take into account the shallow sediments which comprise more coarse-grained materials (Figure 6). Transmissivity calculated with the Papadopulos-Cooper method does indicate less permeable material near the well while T from the Jacob method includes the influences from more permeable material.

Table 4 lists the calculated T values for the various analytical models. Results of the step-drawdown test recovery analysis are also included in Table 4 for completeness.

Analysis of P-3B Time-Drawdown Data. P-3B is screened at a similar elevation to MWBP-05B. The stratigraphic setting indicated that there was a strong likelihood of leakage from upper (more permeable) layers. Therefore leaky confined methods were applied (Hantush-Jacob, 1955 and Walton, 1962). The data (Figure 13) exhibits characteristics of partial penetration. Therefore, in addition to applying the methods for leaky-confined conditions, the Hantush method for partial penetration (Hantush, 1961a, 1961b) was applied, which involved derivation of the appropriate type curve. The best fit of data was obtained from the Hantush partial penetration type curve (Appendix B). Leakage (i.e., water derived from slow release from a bed above the layer being pumped) is likely to have come from an 8-foot thick sandy silt bed identified between the shallow and deeper wells. The Theis recovery method was applied to the recovery data for P-3B for further comparison of T. Table 4 lists the calculated T and S values for the various analytical methods.

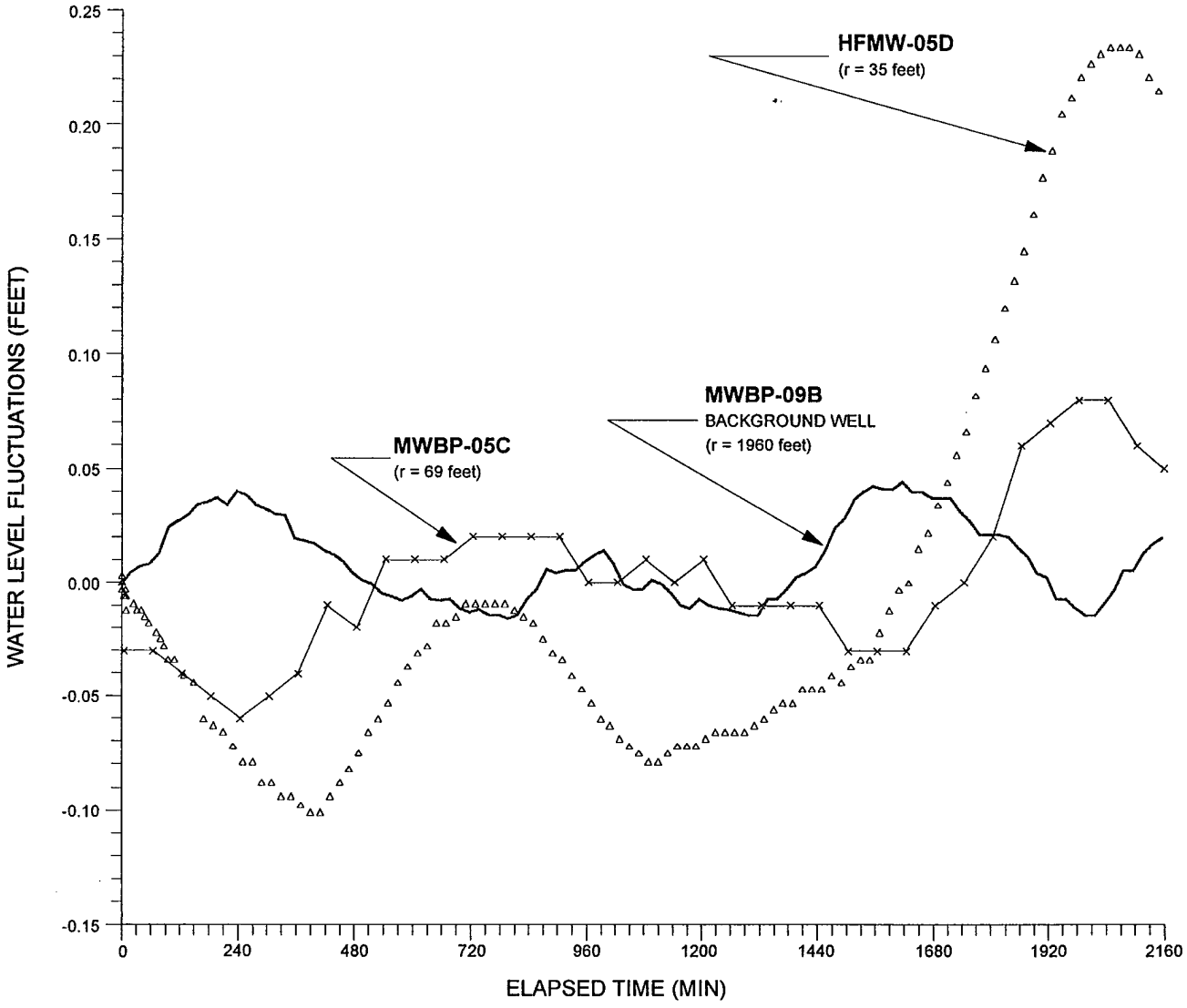
Analysis of P-5B Time-Drawdown Data. Data from P-5B (Figure 14), which is screened at a similar elevation to P-3B and MWBP-05B, shows unexplained fluctuations after 10 minutes. Because there was no explanation for these fluctuations, the first 10 minutes of data only were analyzed. Because of the short time period of data for analysis, the Theis curve was fitted to the

log-log data and the Jacob straight line method was applied for the semi-log data plot. Both of these methods are applicable to confined aquifers. The Theis recovery method was applied to the recovery data for P-5B for further estimation of T. The calculated values of T were unreasonably high when compared to the analyses from P-3B and MWBP-05B (Table 4); therefore, little confidence was given to the values of T and S calculated from P-5B.

Analysis of P-4A Time-Drawdown Data. The drawdown response in observation point P-4A (Figure 13), which is screened in the upper portion of the aquifer, is characteristic of a confined aquifer response. No partial penetration or leakage effects are noted in the drawdown response. Consequently the Theis curve was applied to the time drawdown data. The Theis recovery method was applied to the recovery data for P-5B for comparison of T. The calculated T and S for P-4A are presented in Table 4. The relatively high T value indicates the heterogeneous nature of the aquifer, i.e., there is a greater percentage of coarse-grained aquifer material screened in the shallower wells (A-series) when compared to the deeper wells (B-series) (Figure 6).

Analysis of MWBP-05 Time-Drawdown Data. The drawdown response in observation point MWBP-05 (Figure 14), which is screened in the upper portion of the aquifer (similar to P-4A) is characteristic of a confined aquifer. Consequently the Theis curve was applied to the time drawdown data. The Theis recovery method was applied to the recovery data for P-5B for comparison of T. The calculated T and S for MWBP-05 are presented in Table 4. The T value calculated from the drawdown portion of the test is the same as the value of T calculated for P-4A. No partial penetration or leakage effects are noted in the drawdown response. However, after approximately 1500 minutes the drawdown curve indicates more drawdown than would be anticipated (the data departs above the Theis curve) which may indicate the presence of a barrier boundary (i.e., possible facies change). The test was not run long enough to allow evaluation of the possible barrier boundary. The T value calculated from the recovery portion of the test is relatively high in comparison to the T obtained from the drawdown portion of the test.

Analysis of MWBP-05C and HFMW-05D Time-Drawdown Data. Figure 15 shows water level fluctuations in deep wells MWBP-05C (screened at a depth 20 to 30 feet below the bottom of the pumping well) and HFMW-05D (screened 220 feet below the pumping well). Water level fluctuations in the background well (MWBP-09B) are also displayed in Figure 15. Figure 15 shows that no drawdown response was induced in either well due to pumping in MWBP-05B. This is more significant in MWBP-05C than in HFMW-05D. Two hypotheses are proposed, although neither can be proved or disproved from the pumping test: (1) the pumping rate of 16



NOTES:

MWBP-09B SCREENED AT SAME DEPTH INTERVAL AS MWBP-05B

MWBP-05C SCREENED 20 FEET BELOW THE BOTTOM OF MWBP-05B

HFMW-05D SCREENED 220 FEET BELOW THE BOTTOM OF MWBP-05B

PUMPING RATE IN MWBP-05B IS 16 GPM

FIGURE 15

WATER LEVEL FLUCTUATIONS IN MWBP-05C AND HFMW-05D DURING CONSTANT RATE TEST IN MWBP-05B

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gpm was insufficient to alter the deeper potentiometric lines such that no significant upward flow to the pumping well was created, or (2) a barrier to flow exists between MWBP-05B and MWBP-05C, thereby separating the two flow systems. Chemical sampling data (Table 3) tends to support the second hypothesis in that PCE was detected in the intermediate-depth well (MWBP-05B), but not in the deep well (MWBP-05C).

If a retarding layer is present between the "B" and "C" zones, it is likely a fine-grained silt layer above well MWBP-05C (Figure 6). The aquitard unit displayed in Figure 6 that is present between wells MWBP-06B and MWBP-06C and MW5-01B and MW5-01C may very well extend beneath MWBP-05B. The top elevation of this layer is approximately 194 feet and groundwater is measured at 239 feet. Therefore, the aquifer thickness (b) is 45 feet. Since hydraulic conductivity (K) equals T/b, K near MWBP-12 = 10.2 ft/day and near MWBP-05B = 32 ft/day (Table 5).

Analysis of Distance-Drawdown Data. Thiem-Dupuit distance-drawdown analysis was performed for the wells associated with MWBP-05B. The calculated T value is presented in Table 4.

Synthesis of Results of Aquifer Test at MWBP-05B. Table 4 lists the calculated T and S values for the data collected during testing of MWBP-05B. Table 5 lists the various average T values calculated for both shallow and deep zones during the test in MWBP-05B. The range of values shows the heterogeneity of the aquifer, as is expected from the alluvial type of composition. From Table 5, the average T for the shallow portion is approximately 2,070 ft^2/day, while for the deeper portion it is 825 ft^2/day. T values derived from recovery data were not used to calculate an average T. When all of the pumping phase values for the analyses are averaged, T for the entire thickness is approximately 1,450 ft^2/day. Storativity values from the individual analyses ranged from 0.0002 to 0.024. Higher values were calculated from the shallow sediments. The lower value of 0.0002 was derived from the analysis for P-3B, indicating that water was not released by gravity drainage, but from storage or leakage from above.

4.2.4 Summary and Discussion

It is apparent from the results of the aquifer test analyses that the saturated sediments in the southwestern portion of the Base have highly variable hydraulic properties. Average transmissivity for the uppermost material at MWBP-12 is 460 ft^2/day, whereas near MWBP-05B, it approaches 2,070 ft^2/day, illustrating the anisotropic nature of the sediments. Deeper sediments around MWBP-05B have an average T of 825 ft^2/day, indicating sediments similar in properties

to the sediments at MWBP-12. A reasonable transmissivity value through the entire sediment thickness at MWBP-05B is 1,450 ft^2/day.

The derived hydraulic conductivity (K) around MWBP-12 is 10.2 ft/day, whereas K through the entire portion of material at MWBP-05B is 32 ft/day.

Observation well responses during the test in MWBP-05B show that the "A" and "B" sections are connected and should be considered one unit. This fact suggests that if a groundwater extraction system were to be installed at any point in the future, then it should be designed to intercept the entire aquifer thickness if hydraulic control is a remedial goal. Determining hydraulic properties of small intervals within the upper unit has importance, but has limited value in designing a remedial system. What the aquifer tests demonstrate best is that the individual layers with higher contaminant concentrations can indeed be stressed and can affect a limited radius of influence. If hydraulic control is a remedial objective, then a fully penetrating well would be better suited.

Aquifer tests at MWBP-12 determined that an extraction well with a similar design would be of nominal value in affecting large areas of the PCE plume and several wells would have to be installed to create a barrier across the width of the plume. Tests in MWBP-05B showed that an extraction well with a similar design could produce greater water and affect a larger area. It would also be able to draw water from the more impacted (shallower) zones. However, a well installed through the entire thickness would provide greater efficiency in capturing contaminated groundwater.

5.0 Summary of Events and Findings

Objectives of the field events associated with the pump tests were accomplished:

- A second round of groundwater samples was collected from the eight deep wells installed during the deep aquifer investigation. Results confirmed the findings of earlier samples in that PCE was not detected in the "C" series wells and was only detected in wells at, and downgradient of, the BCP.

- Pumping tests were performed that demonstrated that the "A" and "B" portions of the aquifer are well connected and can be considered part of the same aquifer system.

- Analysis of the pumping test data provided estimates of hydraulic properties of the saturated material around the two test sites.

Responses of observation wells during the pumping tests and background monitoring provided the following understanding of the aquifer system:

- The uppermost water-bearing zone behaves as a confined or semiconfined aquifer. This is thought to be due to fine-grained layers directly overlying the water surface, which inhibit the downward migration of water and the dissipation of atmospheric pressure changes. Responses during the pumping tests were similar to a confined aquifer.

- Shallow sediments around MWBP-12 have a representative transmissivity value of 460 ft^2/day with a storativity of 0.003. Transmissivity around MWBP-05B has a reasonable value of 1,450 ft^2/day and a storativity of 0.007. With a saturated thickness of 45 feet, hydraulic conductivity at MWBP-12 is 10.2 ft/day and at MWBP-05B is 32 ft/day.

- The flow system between the "B" and "C" zones may be separated by a low permeability layer. This is suggested by the lack of water level response in the "C" well when pumping MWBP-05B and by the absence of PCE contamination in groundwater at lower zones. However, contamination by other compounds does exist in deeper aquifer zones, indicating some pathway for migration to deeper regions. More permeable water bearing zones are therefore interconnected across the western portion of the Base.

6.0 References

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APPENDIX A

STEP-DRAWDOWN TEST SUMMARY DATA AND RECOVERY ANALYSIS

Table A-1
Step-Drawdown Test Data Summary for MWBP-12

Discharge Rate (gpm)	Step Time (min)	Elapsed Test Time (min)	MWBP-12 Drawdown (ft)	P-1 Drawdown (ft)
2.5	0	0	0.003	0.003
	0.5	0.5	0.044	0.003
	1	1	0.807	0.019
	2	2	0.924	0.019
	3	3	1.126	0.072
	4	4	1.224	0.091
	5	5	1.284	0.11
	6	6	1.331	0.123
	7	7	1.356	0.133
	8	8	1.385	0.139
	9	9	1.397	0.155
	10	10	1.394	0.155
	20	20	1.46	0.183
	28	28	1.486	0.19
	0	30	1.483	0.199
5	0.0083	30.0083	1.486	0.199
	0.5	30.5	1.959	0.202
	1	31	2.24	0.218
	2	32	2.549	0.25
	3	33	2.719	0.269
	4	34	2.814	0.285
	5	35	2.864	0.297
	6	36	2.899	0.307
	7	37	2.949	0.317
	8	38	3	0.326
	9	39	3.037	0.336
	10	40	3.063	0.345
	16	46	3.138	0.374
	20	50	3.167	0.383
	30	60	3.211	0.399
	40	70	3.233	0.408
	50	80	3.242	0.408
6.5	0.0083	80.0083	3.302	0.412
	0.5	80.5	3.715	0.418
	1	81	3.901	0.427
	2	82	4.157	0.443
	3	83	4.296	0.456
	4	84	4.387	0.465
	5	85	4.459	0.475
	6	86	4.541	0.485
	7	87	4.576	0.491
	8	88	4.601	0.497
	9	89	4.639	0.504
	10	90	4.667	0.507
	14	94	4.724	0.523
	20	100	4.771	0.535
	30	110	4.816	0.548

Table A-1
Step-Drawdown Test Data Summary for MWBP-12

Discharge Rate (gpm)	Step Time (min)	Elapsed Test Time (min)	MWBP-12 Drawdown (ft)	P-1 Drawdown (ft)
	40	120	4.901	0.561
	50	130	4.961	0.573
	60	140	4.998	0.586
	70	150	5.024	0.589
7.0	0.0083	150.0083	5.09	0.589
	0.5	150.5	5.2	0.595
	1	151	5.282	0.595
	2	152	5.373	0.602
	3	153	5.414	0.602
	4	154	5.468	0.605
	5	155	5.465	0.608
	6	156	5.49	0.608
	7	157	5.5	0.611
	8	158	5.477	0.611
	9	159	5.474	0.611
	10	160	5.471	0.611
	14	164	5.481	0.618
	20	170	5.544	0.618
	30	180	5.547	0.627
	40	190	5.622	0.64
	50	200	5.61	0.633
	60	210	5.626	0.64
	0.0083	210.0083	5.572	0.64
	0.1	210.1	4.8	0.637
0.0	0.2	210.2	4.258	0.633
Recovery	0.3	210.3	3.883	0.627
Data	0.4	210.4	3.536	0.621
	0.5	210.5	3.265	0.614
	0.6	210.6	3.047	0.608
	0.7	210.7	2.851	0.599
	0.8	210.8	2.678	0.592
	0.9	210.9	2.53	0.586
	1	211	2.394	0.576
	2	212	1.441	0.504
	3	213	1.019	0.437
	4	214	0.76	0.383
	5	215	0.612	0.342
	6	216	0.508	0.301
	7	217	0.432	0.272
	8	218	0.378	0.25
	9	219	0.34	0.228
	10	220	0.302	0.212
	12	222	0.252	0.183
	14	224	0.211	0.161
	20	230	0.142	0.12
	26	236	0.104	0.095
	28	238	0.091	0.091

Table A-2
Step-Drawdown Test Data Summary for MWBP-05B

Discharge Rate (gpm)	Step Time (min)	Elapsed Test Time (min)	MWBP-05B Drawdown (ft)	P-3B Drawdown (ft)	P-4A Drawdown (ft)
6	0	0	3.401	0.094	-0.025
	0.5	0.5	3.185	0.443	0.009
	1	1	3.427	0.398	0.015
	2	2	3.649	0.436	0.028
	3	3	3.675	0.449	0.038
	4	4	3.687	0.462	0.041
	5	5	3.687	0.462	0.019
	6	6	3.719	0.468	0.047
	7	7	3.732	0.462	0.047
	8	8	3.738	0.468	0.047
	9	9	3.745	0.468	0.047
	10	10	3.713	0.468	0.044
	14	14	3.725	0.468	0.06
	20	20	3.706	0.474	0.057
	30	30	3.719	0.474	0.069
	40	40	3.725	0.474	0.063
	44	44	3.725	0.481	0.085
12	0.0083	44.0083	3.776	0.474	0.079
	0.5	44.5	5.714	0.613	0.076
	1	45	6.718	0.74	0.088
	2	46	7.454	0.86	0.104
	3	47	7.613	0.892	0.114
	4	48	7.607	0.905	0.12
	5	49	7.626	0.911	0.129
	6	50	7.594	0.911	0.129
	7	51	7.651	0.911	0.133
	8	52	7.638	0.905	0.133
	9	53	7.588	0.905	0.136
	10	54	7.581	0.905	0.142
	14	58	7.619	0.911	0.148
	20	64	7.772	0.924	0.158
	30	74	7.778	0.93	0.168
	40	84	7.746	0.924	0.18
	50	94	7.81	0.924	0.183
	60	104	7.797	0.924	0.196
	70	114	7.784	0.924	0.199
	80	124	7.841	0.93	0.209
	90	134	7.784	0.936	0.218
	100	144	7.772	0.936	0.231
	120	164	7.721	0.924	0.24
	130	174	7.835	0.936	0.253
18	0.0083	174.0083	7.905	0.911	0.234
	0.5	174.5	10.063	1.069	0.237
	1	175	11.173	1.202	0.244
	2	176	12.036	1.316	0.266
	3	177	12.327	1.354	0.282
	4	178	12.264	1.36	0.269

Table A-2
Step-Drawdown Test Data Summary for MWBP-05B

Discharge Rate (gpm)	Step Time (min)	Elapsed Test Time (min)	MWBP-05B Drawdown (ft)	P-3B Drawdown (ft)	P-4A Drawdown (ft)
	5	179	12.245	1.36	0.177
	6	180	12.257	1.367	0.256
	7	181	12.473	1.373	0.282
	8	182	12.581	1.392	0.294
	9	183	12.67	1.398	0.304
	10	184	12.714	1.398	0.31
	14	188	12.663	1.405	0.326
	20	194	13.031	1.442	0.345
	30	204	12.923	1.43	0.358
	40	214	12.949	1.43	0.37
	50	224	13.044	1.43	0.38
	60	234	13.113	1.442	0.399
	70	244	13.126	1.449	0.408
19	0.0083	244.0083	13.151	1.461	0.408
	0.5	244.5	12.498	1.474	0.412
	1	245	8.089	1.044	0.389
	2	246	8.114	0.892	0.348
	3	247	12.619	1.322	0.367
	4	248	13.627	1.468	0.393
	5	249	13.842	1.506	0.405
	6	250	13.912	1.525	0.402
	7	251	13.912	1.525	0.412
	8	252	13.95	1.518	0.418
	9	253	13.861	1.525	0.421
	10	254	13.931	1.525	0.424
	14	258	13.887	1.525	0.412
	20	264	13.868	1.518	0.437
	24	268	13.836	1.518	0.44
0.0	0.0083	268.0083	12.923	1.455	0.431
Recovery	0.1	268.1	11.332	1.436	0.431
Data	0.2	268.2	9.682	1.354	0.431
	0.3	268.3	8.273	1.253	0.424
	0.4	268.4	7.061	1.145	0.418
	0.5	268.5	6.025	1.037	0.405
	0.6	268.6	5.136	0.936	0.399
	0.7	268.7	4.38	0.848	0.393
	0.8	268.8	3.738	0.759	0.374
	0.9	268.9	3.185	0.683	0.358
	1	269	2.721	0.613	0.345
	2	270	0.591	0.234	0.247
	3	271	0.178	0.12	0.199
	4	272	0.082	0.094	0.177
	5	273	0.057	0.075	0.161
	6	274	0.044	0.069	0.155
	7	275	0.031	0.063	0.148
	8	276	0.038	0.056	0.142
	9	277	0.031	0.056	0.139

1.0 Objective

To estimate aquifer parameters from step-drawdown test recovery data using the method of analysis given in Kawecki (1993).

2.0 Background

Step-drawdown tests were performed in two monitoring wells at the Fresno Air National Guard Base in Fresno, California. The wells tested were MWBP-12 and MWBP-05B. Well MWBP-12 is 4 inches in diameter and is installed to a depth of 92.5 feet below ground surface (bgs). It is screened from 92.5 to 72.5 feet bgs; groundwater occurs at 80.6 feet bgs.

Well MWBP-05B has a diameter of 5 inches and is installed to a depth of 116 feet bgs. It is screened from 116 to 106 feet bgs; groundwater was measured at 80.2 feet bgs at the start of the test.

Traditionally, step-drawdown tests are performed to estimate well efficiencies and specific yields. These analyses are not pertinent in this case because the wells are monitoring wells and were not designed to be extraction/production wells. Step-drawdown tests were run in order to assess the yields of each well for subsequent, more sustained aquifer tests. However, an estimate of the aquifer parameters can be obtained from a fairly recent analysis method published by Kawecki (1993).

2.1 Method

Kawecki states that the popular recovery method of Theis (Theis, 1935; Kruseman and deRidder, 1983) is used to estimate transmissivity by analyzing data from the recovery data from a constant rate discharge test. The equations in the stepped discharge recovery method are a direct extension of the Theis recovery method. If the pump test comprises only one pumping rate and a recovery stage, then the Kawecki method reduces to the Theis recovery method.

Kawecki develops the following equation for residual drawdown (s"):

$$s''(t) = \frac{2.3}{4\pi T}\log[F(t)] \qquad (1)$$

where s"(t) is the residual drawdown at any post-pumping time "t" and T is the aquifer transmissivity. The function F(t) is a time function given by:

$$F(t) = \left(\frac{t - t_1}{t - t_2}\right)^{Q_1} \times \left(\frac{t - t_2}{t - t_3}\right)^{Q_2} \times \ldots \times \left(\frac{t - t_{N-1}}{t - t_N}\right)^{Q_{N-1}} \qquad (2)$$

Equations (1) and (2) are the basis for the stepped discharge recovery method.

2.2 Explanation

The time function F(t) is calculated for each recovery time, t ($t > t_N$), where a recovery measurement is recorded. Q_1 through Q_{N-1} are the consecutive pumping rates for the test and t_1 through t_{N-1} are the cumulative times at which the pumping rates were changed. The time value for t_1 is the beginning of the

first step, or $t = 0$, and t_2 is the end of step 1 and the beginning of step 2. Q_N is the last pump rate, defined as the recovery period, or in other words, $Q = 0$. Likewise, t_N is the elapsed time from the beginning of the test when the recovery period began. The logarithm_{10} of F(t) is then calculated.

An arithmetic graph of residual drawdown vs corresponding values for $\log_{10}[F(t)]$ is then constructed and a straight line is fitted to the data. The slope of the straight line is calculated; the slope is equal to $(2.3/4\pi T)$. Then the transmissivity is found by:

$$T = \frac{2.3}{4\pi \times slope} \qquad (3)$$

2.3 Units

Equation (2) provides F(t) in interesting units. Suppose that the time measurements are in minutes and the pumping rate is in gallons per minute (gpm). The corresponding units are therefore $(\text{min/min})^{\text{gpm}}$. When the logarithm is calculated, the units become simply gpm.

The slope from the straight line also has units which bear some clarification. Slope, by definition, is rise/run, or $\Delta y/\Delta x$. The y-value on the plot is the residual drawdown, measured in feet, for example. In order for the units to cancel correctly, the pumping rate must be converted into ft^3/min. This must be done within the F(t) calculations before it is plotted. Then the unit of the slope is equal to $(ft/ft^3/min)$ which is equal to min/ft^2.

The units in Eq. (3) are then resolved into meaningful units for transmissivity.

3.0 Step-Drawdown Tests

Step-drawdown tests were performed in two wells at the Fresno ANG Base in March 1995. Pumping rates and step durations are provided in Table 1. Residual drawdown measurements were collected electronically

Table 1
Step-Drawdown Summary Information

Step No.	Step Duration (min)	Elapsed Time (min)	Flow Rate (gpm)	Flow Rate (ft^3/min)
Well MWBP-12				
1	30	30	2.5	0.334
2	50	80	5	0.669
3	70	150	6.5	0.869
4	60	210	7	0.936
5	NA	NA	0	0
MWBP-05B				
1	44	44	6	0.802
2	130	174	12	1.605
3	70	244	18	2.408
4	24	268	19	2.542
5	NA	NA	0	0

with pressure transducers and a data logger. Graphs of drawdown versus time are included for each well in Attachment 1. Attachment 2 contains the residual drawdown (recovery) data for each test and the spreadsheets with the calculations for F(t) and log[F(t)].

4.0 Example Calculation

The following example for calculating F(t) is taken from the data for MWBP-12 at recovery time 0.1 minutes (min). The total test duration was 210 min, so t_n = 210.1 min and t_1 = 0, t_2 = 30, t_3 = 80, t_4 = 150, and t_5 = 210 min (see Table 1). Step pumping rates are also in Table 1 with Q_1 = Q for step 1, etc. The calculation for F(t) at t_n = 210.1 min is as follows:

$$F(t) = \left(\frac{210.1-0}{210.1-30}\right)^{0.334} \times \left(\frac{210.1-30}{210.1-80}\right)^{0.668} \times \left(\frac{210.1-80}{210.1-150}\right)^{0.869} \times \left(\frac{210.1-150}{210.1-210}\right)^{0.936} \quad (4)$$

Equation 4 reduces to:

$$F(t) = (1.1666)^{0.334} \times (1.3843)^{0.668} \times (2.1647)^{0.869} \times (601.0)^{0.936}$$

$$F(t) = 1.0528 \times 1.2426 \times 1.9564 \times 399.0493 = 1021.32$$

and the log(1021.32) = 3.0092.

This calculation is then performed for each recovery measurement. The spreadsheets in Attachment 2 were developed to perform these calculations. The graph for log[F(t)] vs. residual drawdown for MWBP-12 is shown in Attachment 2; also shown on the graph is the selected straight line fit. The slope of the line is:

$$Slope = \left(\frac{4.5-0.5 \ (ft)}{2.78-1.43 \ (ft^3/\text{min})} \right) = 2.96 \ \text{min}/ft^2$$

From Eq. 3, the transmissivity, T, is 0.062 ft^2/min = 89 ft^2/day.

5.0 Results

Table 2
Summary of Recovery Analysis

Well ID	Slope from Graphs (min/ft^2)	T (ft^2/day)
MWBP-12	2.96	89
MWBP-05B	4.23	62

Attachment 2 contains the recovery data curves, selected straight line fits, slope calculations and T-value calculations.

6.0 Discussion

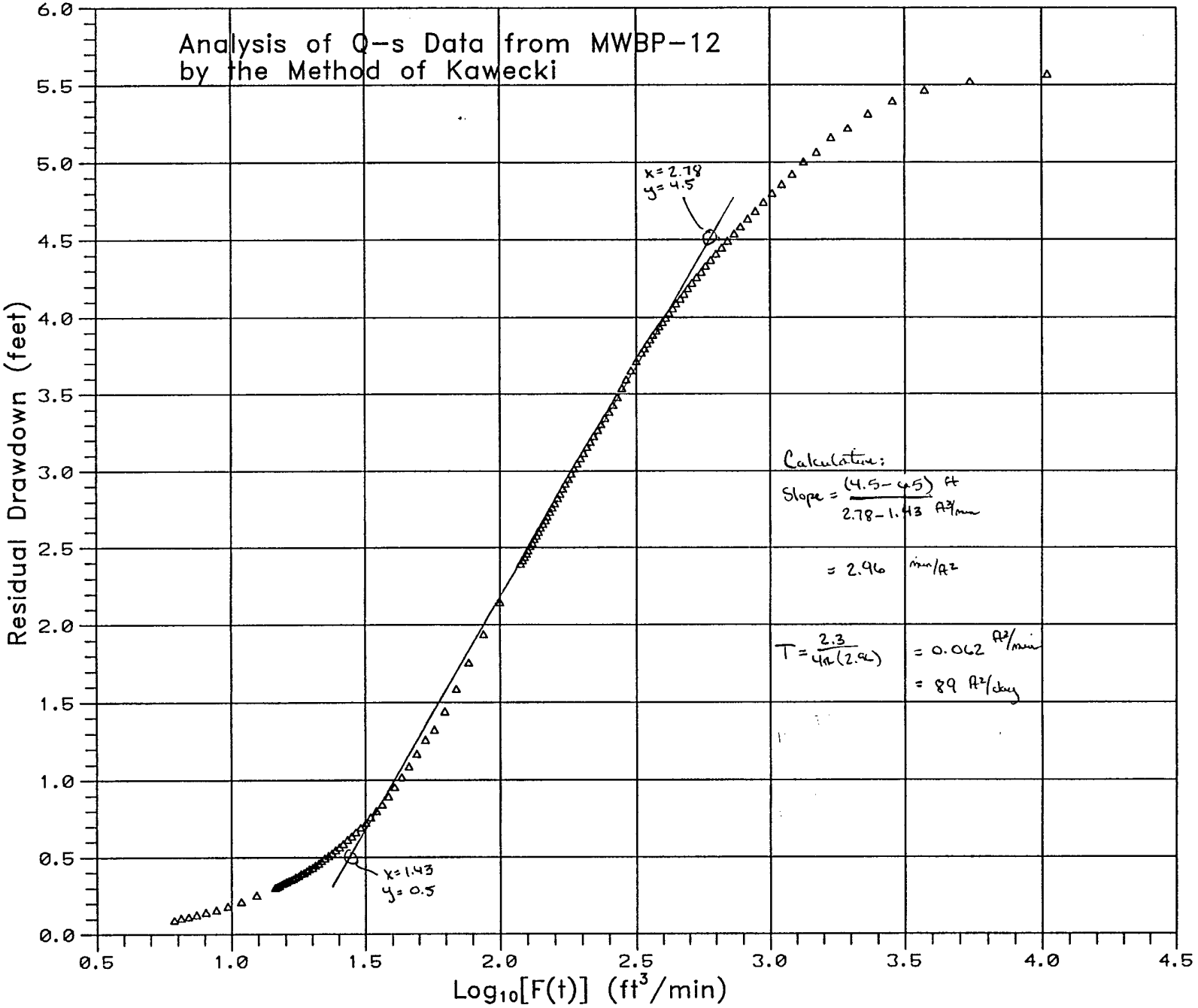
Once a spreadsheet is developed for handling the tedious F(t) calculations, this method is relatively simple to implement. However, it is highly dependent on the interpretation for the straight line. A linear regression can also be evaluated to provide a second assessment of the slope. These are listed at the end of the spreadsheets in Attachment 2.

7.0 References

Kawecki, M. W., 1993, "Recovery Analysis from Pumping Tests with Stepped Discharge," Groundwater, Vol. 31, No. 4, pp. 585-592.

Kruseman, G. P., N. A. deRidder, 1990, Analysis and Evaluation of Pumping Test Data, International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, Second edition, 377 pp.

Theis, C. V., 1935, The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, Transactions, American Geophysical Union, Vol. 16, pp. 519-524.


Analysis of Q–s Data from MWBP-12
by the Method of Kawecki
Residual Drawdown (feet)
Log10[F(t)] (ft³/min)
x = 2.78
y = 4.5
x = 1.43
y = 0.5
Calculation:
Slope = (4.5 − 4.5) ft / (2.78 − 1.43) ft²/min
= 2.96 min/ft²
T = 2.3 / 4π(2.96) = 0.062 ft²/min
= 89 ft²/day

Analysis of MWBP-12 Step-Drawdown Recovery Data by the Method of Kawecki

Pumping Data

	Elapsed Time (min)	Flow Rate (gpm)	Flow Rate (cu.ft/min)
Q_1, t_1	0	2.5	0.334
Q_2, t_2	30	5	0.668
Q_3, t_3	80	6.5	0.869
Q_4, t_4	150	7	0.936
Q_5, t_5	210	0	0

Recovery Data

	Elapsed Recovery Time (min)	Residual Drawdown MWBP-12	F(t)	log[F(t)]	Residual Drawdown MWBP-12
0.0083	210.0083	5.572	10487.84	4.0207	5.572
0.0166	210.0166	5.525	5482.061	3.7389	5.525
0.025	210.025	5.468	3736.934	3.5725	5.468
0.0333	210.0333	5.396	2857.601	3.4560	5.396
0.0416	210.0416	5.314	2320.385	3.3656	5.314
0.05	210.05	5.219	1953.519	3.2908	5.219
0.0583	210.0583	5.159	1692.037	3.2284	5.159
0.0666	210.0666	5.065	1493.915	3.1743	5.065
0.075	210.075	5.002	1336.788	3.1261	5.002
0.0833	210.0833	4.923	1211.764	3.0834	4.923
0.0916	210.0916	4.857	1108.74	3.0448	4.857
0.1	210.1	4.8	1021.377	3.0092	4.8
0.1083	210.1083	4.74	947.973	2.9768	4.74
0.1166	210.1166	4.683	884.7088	2.9468	4.683
0.125	210.125	4.633	828.9812	2.9185	4.633
0.1333	210.1333	4.582	780.6088	2.8924	4.582
0.1416	210.1416	4.538	737.7365	2.8679	4.538
0.15	210.15	4.491	699.0324	2.8445	4.491
0.1583	210.1583	4.447	664.7014	2.8226	4.447
0.1666	210.1666	4.409	633.6872	2.8019	4.409
0.175	210.175	4.368	605.2034	2.7819	4.368
0.1833	210.1833	4.33	579.5446	2.7631	4.33
0.1916	210.1916	4.292	556.0409	2.7451	4.292
0.2	210.2	4.258	534.1794	2.7277	4.258
0.2083	210.2083	4.22	514.2568	2.7112	4.22
0.2166	210.2166	4.185	495.8141	2.6953	4.185
0.225	210.225	4.15	478.4919	2.6799	4.15
0.2333	210.2333	4.119	462.5633	2.6652	4.119
0.2416	210.2416	4.087	447.6954	2.6510	4.087
0.25	210.25	4.056	433.6225	2.6371	4.056
0.2583	210.2583	4.028	420.5883	2.6239	4.028
0.2666	210.2666	3.996	408.3405	2.6110	3.996
0.275	210.275	3.968	396.6746	2.5984	3.968
0.2833	210.2833	3.939	385.806	2.5864	3.939
0.2916	210.2916	3.911	375.5369	2.5747	3.911
0.3	210.3	3.883	365.7047	2.5631	3.883
0.3083	210.3083	3.854	356.4993	2.5521	3.854

Analysis of MWBP-12 Step-Drawdown Recovery Data by the Method of Kawecki

	Recovery Data				
	Elapsed Recovery Time (min)	Residual Drawdown MWBP-12	F(t)	log[F(t)]	Residual Drawdown MWBP-12
0.3166	210.3166	3.826	347.7617	2.5413	3.826
0.325	210.325	3.797	339.359	2.5307	3.797
0.3333	210.3333	3.769	331.4593	2.5204	3.769
0.35	210.35	3.712	316.6654	2.5006	3.712
0.3666	210.3666	3.652	303.2551	2.4818	3.652
0.3833	210.3833	3.592	290.9002	2.4637	3.592
0.4	210.4	3.536	279.5454	2.4465	3.536
0.4166	210.4166	3.479	269.1332	2.4300	3.479
0.4333	210.4333	3.428	259.4385	2.4140	3.428
0.45	210.45	3.384	250.4412	2.3987	3.384
0.4666	210.4666	3.343	242.1165	2.3840	3.343
0.4833	210.4833	3.302	234.3008	2.3698	3.302
0.5	210.5	3.265	226.9912	2.3560	3.265
0.5166	210.5166	3.227	220.1792	2.3428	3.227
0.5333	210.5333	3.189	213.7408	2.3299	3.189
0.55	210.55	3.154	207.6814	2.3174	3.154
0.5666	210.5666	3.116	202.0012	2.3054	3.116
0.5833	210.5833	3.082	196.603	2.2936	3.082
0.6	210.6	3.047	191.4959	2.2822	3.047
0.6166	210.6166	3.012	186.6851	2.2711	3.012
0.6333	210.6333	2.981	182.0918	2.2603	2.981
0.65	210.65	2.946	177.7273	2.2498	2.946
0.6666	210.6666	2.914	173.5989	2.2395	2.914
0.6833	210.6833	2.883	169.6417	2.2295	2.883
0.7	210.7	2.851	165.8675	2.2198	2.851
0.7166	210.7166	2.823	162.2848	2.2103	2.823
0.7333	210.7333	2.788	158.839	2.2010	2.788
0.75	210.75	2.76	155.542	2.1918	2.76
0.7666	210.7666	2.732	152.4026	2.1830	2.732
0.7833	210.7833	2.703	149.3743	2.1743	2.703
0.8	210.8	2.678	146.4686	2.1657	2.678
0.8166	210.8166	2.653	143.6944	2.1574	2.653
0.8333	210.8333	2.628	141.0115	2.1493	2.628
0.85	210.85	2.602	138.4307	2.1412	2.602
0.8666	210.8666	2.577	135.9609	2.1334	2.577
0.8833	210.8833	2.555	133.5669	2.1257	2.555
0.9	210.9	2.53	131.2591	2.1181	2.53
0.9166	210.9166	2.508	129.0457	2.1107	2.508
0.9333	210.9333	2.482	126.896	2.1034	2.482
0.95	210.95	2.46	124.8196	2.0963	2.46
0.9666	210.9666	2.438	122.8244	2.0893	2.438
0.9833	210.9833	2.416	120.8831	2.0824	2.416
1	211	2.394	119.0046	2.0756	2.394
1.2	211.2	2.145	100.456	2.0020	2.145
1.4	211.4	1.94	87.06408	1.9398	1.94

Analysis of MWBP-12 Step-Drawdown Recovery Data by the Method of Kawecki

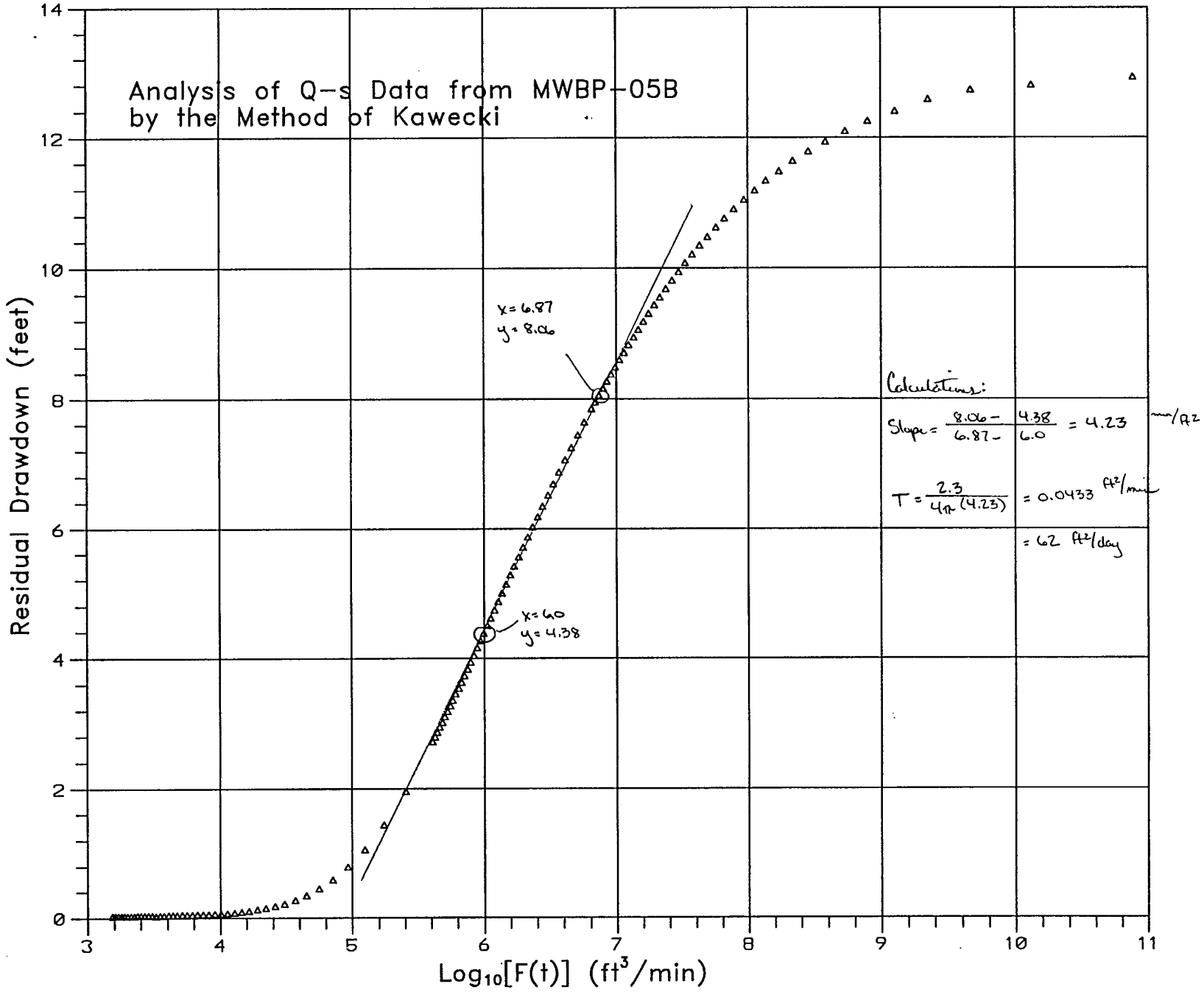
	Recovery Data				
	Elapsed Recovery Time (min)	Residual Drawdown MWBP-12	F(t)	log[F(t)]	Residual Drawdown MWBP-12
1.6	211.6	1.757	76.92774	1.8861	1.757
1.8	211.8	1.587	68.98073	1.8387	1.587
2	212	1.441	62.57798	1.7964	1.441
2.2	212.2	1.325	57.30598	1.7582	1.325
2.4	212.4	1.259	52.88726	1.7234	1.259
2.6	212.6	1.17	49.12856	1.6913	1.17
2.8	212.8	1.091	45.89113	1.6617	1.091
3	213	1.019	43.07269	1.6342	1.019
3.2	213.2	0.956	40.59617	1.6085	0.956
3.4	213.4	0.896	38.4024	1.5844	0.896
3.6	213.6	0.842	36.44516	1.5616	0.842
3.8	213.8	0.801	34.68783	1.5402	0.801
4	214	0.76	33.10102	1.5198	0.76
4.2	214.2	0.722	31.66082	1.5005	0.722
4.4	214.4	0.691	30.34765	1.4821	0.691
4.6	214.6	0.662	29.14527	1.4646	0.662
4.8	214.8	0.634	28.04008	1.4478	0.634
5	215	0.612	27.02067	1.4317	0.612
5.2	215.2	0.586	26.07733	1.4163	0.586
5.4	215.4	0.564	25.20178	1.4014	0.564
5.6	215.6	0.545	24.38689	1.3872	0.545
5.8	215.8	0.523	23.62652	1.3734	0.523
6	216	0.508	22.91533	1.3601	0.508
6.2	216.2	0.492	22.24864	1.3473	0.492
6.4	216.4	0.476	21.62237	1.3349	0.476
6.6	216.6	0.46	21.03292	1.3229	0.46
6.8	216.8	0.448	20.47711	1.3113	0.448
7	217	0.432	19.95211	1.3000	0.432
7.2	217.2	0.422	19.45539	1.2890	0.422
7.4	217.4	0.41	18.98473	1.2784	0.41
7.6	217.6	0.397	18.53809	1.2681	0.397
7.8	217.8	0.391	18.11368	1.2580	0.391
8	218	0.378	17.70984	1.2482	0.378
8.2	218.2	0.369	17.32512	1.2387	0.369
8.4	218.4	0.359	16.95817	1.2294	0.359
8.6	218.6	0.353	16.60778	1.2203	0.353
8.8	218.8	0.347	16.27284	1.2115	0.347
9	219	0.34	15.95234	1.2028	0.34
9.2	219.2	0.331	15.64536	1.1944	0.331
9.4	219.4	0.325	15.35105	1.1861	0.325
9.6	219.6	0.315	15.06864	1.1781	0.315
9.8	219.8	0.309	14.79741	1.1702	0.309
10	220	0.302	14.53671	1.1625	0.302
12	222	0.252	12.39487	1.0932	0.252
14	224	0.211	10.84931	1.0354	0.211

Analysis of MWBP-12 Step-Drawdown Recovery Data by the Method of Kawecki

Recovery Data

	Elapsed Recovery Time (min)	Residual Drawdown MWBP-12	F(t)	log[F(t)]	Residual Drawdown MWBP-12
16	226	0.183	9.680078	0.9859	0.183
18	228	0.157	8.763837	0.9427	0.157
20	230	0.142	8.025986	0.9045	0.142
22	232	0.126	7.418717	0.8703	0.126
24	234	0.113	6.909955	0.8395	0.113
26	236	0.104	6.477369	0.8114	0.104
28	238	0.091	6.104925	0.7857	0.091

$$F(t) = [(t_n-t_1)/(t_n-t_2)^{Q_1} \times (t_n-t_2)/(t_n-t_3)^{Q_2} \times (t_n-t_3)/(t_n-t_4)^{Q_3} \times (t_n-t_4)/(t_n-t_5)^{Q_4}]$$


Analysis of Q-s Data from MWBP-05B
by the Method of Kawecki
Residual Drawdown (feet)
Log10[F(t)] (ft³/min)
0
2
4
6
8
10
12
14
3
4
5
6
7
8
9
10
11
x = 6.87
y = 8.06
x = 6.0
y = 4.38
Calculations:
Slope = (8.06 − 4.38) / (6.87 − 6.0) = 4.23 ft/Δz
T = 2.3 / 4π(4.23) = 0.0433 ft²/min
= 62 ft²/day

Analysis of MWBP-05B Step-Drawdown Recovery Data by the Method of Kawecki

Pumping Data

	Elapsed Time (min)	Flow Rate (gpm)	Flow Rate (cu.ft/min)
Q_1, t_1	0	6	0.802
Q_2, t_2	44	12	1.604
Q_3, t_3	174	18	2.406
Q_4, t_4	244	19	2.54
Q_5, t_5	268	0	0

Recovery Data

	Elapsed Recovery Time (min)	Residual Drawdown MWBP-05B	F(t)	log[F(t)]	Residual Drawdown MWBP-05B
0.0083	268.0083	12.923	7.68E+10	10.88528	12.923
0.0166	268.0166	12.803	1.32E+10	10.12073	12.803
0.025	268.025	12.727	4.67E+09	9.669117	12.727
0.0333	268.0333	12.587	2.25E+09	9.352951	12.587
0.0416	268.0416	12.403	1.28E+09	9.107536	12.403
0.05	268.05	12.257	8.03E+08	8.904725	12.257
0.0583	268.0583	12.099	5.44E+08	8.735385	12.099
0.0666	268.0666	11.934	3.88E+08	8.588633	11.934
0.075	268.075	11.782	2.87E+08	8.457678	11.782
0.0833	268.0833	11.636	2.2E+08	8.341969	11.636
0.0916	268.0916	11.477	1.73E+08	8.237268	11.477
0.1	268.1	11.332	1.38E+08	8.140558	11.332
0.1083	268.1083	11.186	1.13E+08	8.052676	11.186
0.1166	268.1166	11.04	93603509	7.971292	11.04
0.125	268.125	10.894	78456754	7.89463	10.894
0.1333	268.1333	10.754	66648073	7.823788	10.754
0.1416	268.1416	10.615	57178126	7.75723	10.615
0.15	268.15	10.475	49400810	7.693734	10.475
0.1583	268.1583	10.342	43092205	7.634399	10.342
0.1666	268.1666	10.209	37852984	7.5781	10.209
0.175	268.175	10.075	33412827	7.523913	10.075
0.1833	268.1833	9.942	29707873	7.472872	9.942
0.1916	268.1916	9.815	26551800	7.424094	9.815
0.2	268.2	9.682	23814287	7.376838	9.682
0.2083	268.2083	9.555	21481141	7.332057	9.555
0.2166	268.2166	9.435	19454942	7.28903	9.435
0.225	268.225	9.308	17665828	7.247134	9.308
0.2333	268.2333	9.187	16115673	7.207248	9.187
0.2416	268.2416	9.067	14748911	7.16876	9.067
0.25	268.25	8.952	13524888	7.131134	8.952
0.2583	268.2583	8.832	12450293	7.09518	8.832
0.2666	268.2666	8.717	11491191	7.060365	8.717
0.275	268.275	8.603	10622333	7.02622	8.603
0.2833	268.2833	8.489	9851285	6.993493	8.489
0.2916	268.2916	8.381	9156154	6.961713	8.381
0.3	268.3	8.273	8520410	6.93046	8.273
0.3083	268.3083	8.165	7951149	6.90043	8.165

Analysis of MWBP-05B Step-Drawdown Recovery Data by the Method of Kawecki

	Recovery Data				
	Elapsed Recovery Time (min)	Residual Drawdown MWBP-05B	F(t)	log[F(t)]	Residual Drawdown MWBP-05B
0.3166	268.3166	8.057	7433599	6.871199	8.057
0.325	268.325	7.949	6956458	6.842388	7.949
0.3333	268.3333	7.848	6525960	6.814644	7.848
0.35	268.35	7.645	5765838	6.760862	7.645
0.3666	268.3666	7.442	5127370	6.709895	7.442
0.3833	268.3833	7.245	4580406	6.660904	7.245
0.4	268.4	7.061	4111585	6.614009	7.061
0.4166	268.4166	6.876	3709393	6.569303	6.876
0.4333	268.4333	6.699	3358115	6.526096	6.699
0.45	268.45	6.521	3051602	6.484528	6.521
0.4666	268.4666	6.349	2784300	6.444716	6.349
0.4833	268.4833	6.184	2547264	6.406074	6.184
0.5	268.5	6.025	2337489	6.36875	6.025
0.5166	268.5166	5.867	2152133	6.332869	5.867
0.5333	268.5333	5.714	1985739	6.297922	5.714
0.55	268.55	5.562	1836781	6.264057	5.562
0.5666	268.5666	5.416	1703743	6.231404	5.416
0.5833	268.5833	5.276	1583104	6.199509	5.276
0.6	268.6	5.136	1474075	6.168519	5.136
0.6166	268.6166	5.003	1375822	6.138562	5.003
0.6333	268.6333	4.869	1285972	6.109232	4.869
0.65	268.65	4.742	1204116	6.080668	4.742
0.6666	268.6666	4.621	1129790	6.052998	4.621
0.6833	268.6833	4.501	1061332	6.025851	4.501
0.7	268.7	4.38	998535.2	5.999363	4.38
0.7166	268.7166	4.266	941145.4	5.973657	4.266
0.7333	268.7333	4.158	887958.3	5.948393	4.158
0.75	268.75	4.043	838881.5	5.923701	4.043
0.7666	268.7666	3.942	793777.4	5.899699	3.942
0.7833	268.7833	3.834	751751.3	5.876074	3.834
0.8	268.8	3.738	712772.9	5.852951	3.738
0.8166	268.8166	3.637	676773.1	5.830443	3.637
0.8333	268.8333	3.541	643071.6	5.808259	3.541
0.85	268.85	3.452	611672.2	5.786519	3.452
0.8666	268.8666	3.357	582546.2	5.76533	3.357
0.8833	268.8833	3.268	555166	5.744423	3.268
0.9	268.9	3.185	529553.2	5.72391	3.185
0.9166	268.9166	3.103	505703.2	5.703896	3.103
0.9333	268.9333	3.02	483199.2	5.684126	3.02
0.95	268.95	2.944	462072.4	5.66471	2.944
0.9666	268.9666	2.867	442331.5	5.645748	2.867
0.9833	268.9833	2.791	423642.8	5.627	2.791
1	269	2.721	406041.1	5.60857	2.721
1.2	269.2	1.958	256574.9	5.409214	1.958
1.4	269.4	1.437	174151.9	5.240928	1.437
1.6	269.6	1.055	124561	5.095382	1.055

Analysis of MWBP-05B Step-Drawdown Recovery Data by the Method of Kawecki

	Recovery Data				
	Elapsed Recovery Time (min)	Residual Drawdown MWBP-05B	F(t)	log[F(t)]	Residual Drawdown MWBP-05B
1.8	269.8	0.788	92726.16	4.967202	0.788
2	270	0.591	71239.44	4.85272	0.591
2.2	270.2	0.451	56146.14	4.74932	0.451
2.4	270.4	0.343	45192.71	4.655068	0.343
2.6	270.6	0.273	37025.32	4.568499	0.273
2.8	270.8	0.216	30794.32	4.488471	0.216
3	271	0.178	25946.56	4.41408	0.178
3.2	271.2	0.152	22110.44	4.344597	0.152
3.4	271.4	0.127	19029.5	4.279427	0.127
3.6	271.6	0.108	16522.51	4.218076	0.108
3.8	271.8	0.095	14458.71	4.16013	0.095
4	272	0.082	12742.02	4.105238	0.082
4.2	272.2	0.076	11300.64	4.053103	0.076
4.4	272.4	0.069	10080.16	4.003467	0.069
4.6	272.6	0.063	9038.749	3.956108	0.063
4.8	272.8	0.057	8143.889	3.910832	0.057
5	273	0.057	7369.999	3.867467	0.057
5.2	273.2	0.057	6696.761	3.825865	0.057
5.4	273.4	0.05	6107.881	3.785891	0.05
5.6	273.6	0.05	5590.183	3.747426	0.05
5.8	273.8	0.05	5132.925	3.710365	0.05
6	274	0.044	4727.285	3.674612	0.044
6.2	274.2	0.044	4365.968	3.640081	0.044
6.4	274.4	0.044	4042.903	3.606693	0.044
6.6	274.6	0.038	3753.009	3.57438	0.038
6.8	274.8	0.038	3492.006	3.543075	0.038
7	275	0.031	3256.273	3.512721	0.031
7.2	275.2	0.038	3042.729	3.483263	0.038
7.4	275.4	0.038	2848.741	3.454653	0.038
7.6	275.6	0.038	2672.05	3.426845	0.038
7.8	275.8	0.038	2510.708	3.399796	0.038
8	276	0.038	2363.03	3.373469	0.038
8.2	276.2	0.031	2227.553	3.347828	0.031
8.4	276.4	0.031	2102.999	3.322839	0.031
8.6	276.6	0.031	1988.253	3.298472	0.031
8.8	276.8	0.031	1882.336	3.274697	0.031
9	277	0.031	1784.385	3.251489	0.031
9.2	277.2	0.031	1693.64	3.228821	0.031
9.4	277.4	0.031	1609.426	3.206671	0.031
9.6	277.6	0.031	1531.146	3.185017	0.031

$$F(t) = [(t_n-t_1)/(t_n-t_2)^{Q_1} \times (t_n-t_2)/(t_n-t_3)^{Q_2} \times (t_n-t_3)/(t_n-t_4)^{Q_3} \times (t_n-t_4)/(t_n-t_5)^{Q_4}]$$

APPENDIX B

CONSTANT RATE TEST DATA
BACKGROUND MONITORING DATA
DATA ANALYSIS SUMMARY

Table B-1
20-Hour Constant Rate Discharge Test Data for MWBP-12
(Flow Rate = 7.5 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-12	P-1	P-2	MWBP-12 (corrected)	P-1 (corrected)	P-2 (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Cumulative Fluctuation in MWBP-09A
0	0.231	0	0	0.231	0	0			
0.0083	0.329	0	0	0.329	0	0			
0.0166	0.427	0	0	0.427	0	0			
0.025	0.503	0	0	0.503	0	0			
0.0333	0.598	0	0	0.598	0	0			
0.0416	0.681	0	0	0.681	0	0			
0.05	0.747	0	0	0.747	0	0			
0.0583	0.814	0	0	0.814	0	0			
0.0666	0.883	0	0	0.883	0	0			
0.075	0.947	0	0	0.947	0	0			
0.0833	1	0	0.003	1	0	0.003			
0.0916	1.061	0	0.003	1.061	0	0.003			
0.1	1.108	0	0	1.108	0	0			
0.1083	1.162	0	0	1.162	0	0			
0.1166	1.216	0.003	0	1.216	0.003	0			
0.125	1.26	0.003	0.003	1.26	0.003	0.003			
0.1333	1.311	0.003	0.003	1.311	0.003	0.003			
0.1416	1.352	0.006	0	1.352	0.006	0			
0.15	1.403	0.006	0	1.403	0.006	0			
0.1583	1.444	0.006	0	1.444	0.006	0			
0.1666	1.491	0.009	0	1.491	0.009	0			
0.175	1.523	0.009	0	1.523	0.009	0			
0.1833	1.561	0.009	0.003	1.561	0.009	0.003			
0.1916	1.599	0.012	0.003	1.599	0.012	0.003			
0.2	1.631	0.012	0.003	1.631	0.012	0.003			
0.2083	1.672	0.012	0.003	1.672	0.012	0.003			
0.2166	1.688	0.015	0	1.688	0.015	0			
0.225	1.716	0.015	0.003	1.716	0.015	0.003			
0.2333	1.757	0.015	0	1.757	0.015	0			
0.2416	1.77	0.015	0	1.77	0.015	0			
0.25	1.795	0.018	0	1.795	0.018	0			
0.2583	1.821	0.018	0.003	1.821	0.018	0.003			
0.2666	1.849	0.022	0.003	1.849	0.022	0.003			
0.275	1.862	0.022	0	1.862	0.022	0			
0.2833	1.893	0.022	0.003	1.893	0.022	0.003			
0.2916	1.912	0.025	0.003	1.912	0.025	0.003			
0.3	1.931	0.025	0	1.931	0.025	0			
0.3083	1.954	0.028	0	1.954	0.028	0			
0.3166	1.976	0.028	0	1.976	0.028	0			
0.325	1.985	0.028	0	1.985	0.028	0			
0.3333	2.011	0.031	0	2.011	0.031	0			
0.35	2.042	0.031	0	2.042	0.031	0			
0.3666	2.077	0.034	0.003	2.077	0.034	0.003			
0.3833	2.112	0.037	0	2.112	0.037	0			
0.4	2.137	0.037	0.003	2.137	0.037	0.003			
0.4166	2.162	0.041	0	2.162	0.041	0			
0.4333	2.194	0.041	0	2.194	0.041	0			
0.45	2.216	0.044	0	2.216	0.044	0			
0.4666	2.238	0.047	0	2.238	0.047	0			
0.4833	2.264	0.047	0	2.264	0.047	0			
0.5	2.283	0.05	0	2.283	0.05	0			

Table B-1
20-Hour Constant Rate Discharge Test Data for MWBP-12
(Flow Rate = 7.5 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-12	P-1	P-2	MWBP-12 (corrected)	P-1 (corrected)	P-2 (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Cumulative Fluctuation in MWBP-09A
0.5166	2.299	0.053	0	2.299	0.053	0			
0.5333	2.314	0.056	0	2.314	0.056	0			
0.55	2.321	0.056	0	2.321	0.056	0			
0.5666	2.327	0.059	0	2.327	0.059	0			
0.5833	2.33	0.059	0	2.33	0.059	0			
0.6	2.333	0.063	-0.003	2.333	0.063	-0.003			
0.6166	2.333	0.063	0	2.333	0.063	0			
0.6333	2.333	0.066	0	2.333	0.066	0			
0.65	2.333	0.066	0	2.333	0.066	0			
0.6666	2.333	0.069	0	2.333	0.069	0			
0.6833	2.333	0.072	-0.003	2.333	0.072	-0.003			
0.7	2.333	0.072	-0.003	2.333	0.072	-0.003			
0.7166	2.337	0.075	0	2.337	0.075	0			
0.7333	2.333	0.075	0	2.333	0.075	0			
0.75	2.337	0.078	0	2.337	0.078	0			
0.7666	2.333	0.078	0	2.333	0.078	0			
0.7833	2.333	0.082	-0.003	2.333	0.082	-0.003			
0.8	2.337	0.082	-0.003	2.337	0.082	-0.003			
0.8166	2.333	0.085	0	2.333	0.085	0			
0.8333	2.333	0.085	-0.003	2.333	0.085	-0.003			
0.85	2.333	0.088	0	2.333	0.088	0			
0.8666	2.337	0.091	-0.003	2.337	0.091	-0.003			
0.8833	2.333	0.091	-0.003	2.333	0.091	-0.003			
0.9	2.333	0.091	-0.003	2.333	0.091	-0.003			
0.9166	2.333	0.094	-0.003	2.333	0.094	-0.003			
0.9333	2.333	0.094	-0.003	2.333	0.094	-0.003			
0.95	2.435	0.097	-0.003	2.435	0.097	-0.003			
0.9666	2.593	0.1	-0.003	2.593	0.1	-0.003			
0.9833	2.742	0.1	-0.003	2.742	0.1	-0.003			
1	2.91	0.104	-0.003	2.91	0.104	-0.003	1	0.000	0.163
1.2	3.248	0.132	-0.003	3.248	0.132	-0.003		0.000	
1.4	3.245	0.157	0	3.245	0.157	0		0.000	
1.6	3.245	0.176	0	3.245	0.176	0		0.000	
1.8	3.289	0.195	0	3.289	0.195	0		0.000	
2	3.419	0.211	0	3.419	0.211	0		0.000	
2.2	3.992	0.223	0	3.992	0.223	0		0.000	
2.4	4.096	0.239	0	4.096	0.239	0		0.000	
2.6	4.182	0.252	0.003	4.182	0.252	0.003		0.000	
2.8	4.261	0.265	0.003	4.261	0.265	0.003		0.000	
3	4.337	0.277	0.003	4.337	0.277	0.003		0.000	
3.2	4.4	0.29	0.006	4.4	0.29	0.006		0.000	
3.4	4.463	0.296	0.003	4.463	0.296	0.003		0.000	
3.6	4.526	0.306	0.006	4.526	0.306	0.006		0.000	
3.8	4.58	0.315	0.006	4.58	0.315	0.006		0.000	
4	4.631	0.324	0.006	4.631	0.324	0.006		0.000	
4.2	4.678	0.331	0.003	4.678	0.331	0.003		0.000	
4.4	4.716	0.334	0.003	4.716	0.334	0.003		0.000	
4.6	4.754	0.343	0.006	4.754	0.343	0.006		0.000	
4.8	4.792	0.353	0.006	4.792	0.353	0.006		0.000	
5	4.824	0.359	0.006	4.824	0.359	0.006		0.000	
5.2	4.855	0.362	0.006	4.855	0.362	0.006		0.000	

Table B-1
20-Hour Constant Rate Discharge Test Data for MWBP-12
(Flow Rate = 7.5 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-12	P-1	P-2	MWBP-12 (corrected)	P-1 (corrected)	P-2 (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Cumulative Fluctuation in MWBP-09A
5.4	4.881	0.369	0.006	4.881	0.369	0.006		0.000	
5.6	4.906	0.375	0.006	4.906	0.375	0.006		0.000	
5.8	4.938	0.381	0.006	4.938	0.381	0.006		0.000	
6	4.963	0.384	0.006	4.963	0.384	0.006		0.000	
6.2	4.985	0.391	0.006	4.985	0.391	0.006		0.000	
6.4	5.007	0.394	0.009	5.007	0.394	0.009		0.000	
6.6	5.033	0.4	0.009	5.033	0.4	0.009		0.000	
6.8	5.052	0.403	0.006	5.052	0.403	0.006		0.000	
7	5.071	0.406	0.006	5.071	0.406	0.006		0.000	
7.2	5.093	0.413	0.006	5.093	0.413	0.006		0.000	
7.4	5.112	0.416	0.006	5.112	0.416	0.006		0.000	
7.6	5.102	0.422	0.009	5.102	0.422	0.009		0.000	
7.8	5.124	0.425	0.006	5.124	0.425	0.006		0.000	
8	5.143	0.429	0.006	5.143	0.429	0.006		0.000	
8.2	5.162	0.432	0.006	5.162	0.432	0.006		0.000	
8.4	5.175	0.435	0.006	5.175	0.435	0.006		0.000	
8.6	5.188	0.438	0.009	5.188	0.438	0.009		0.000	
8.8	5.2	0.441	0.006	5.2	0.441	0.006		0.000	
9	5.219	0.447	0.009	5.219	0.447	0.009		0.000	
9.2	5.229	0.444	0.006	5.229	0.444	0.006		0.000	
9.4	5.241	0.447	0.006	5.241	0.447	0.006		0.000	
9.6	5.245	0.454	0.006	5.245	0.454	0.006		0.000	
9.8	5.254	0.457	0.009	5.254	0.457	0.009		0.000	
10	5.295	0.46	0.009	5.295	0.46	0.009		0.000	
12	5.697	0.495	0.009	5.697	0.495	0.009		0.000	
14	5.725	0.514	0.012	5.725	0.514	0.012		0.000	
16	5.788	0.533	0.012	5.788	0.533	0.012		0.000	
18	5.849	0.548	0.012	5.849	0.548	0.012		0.000	
20	5.883	0.561	0.012	5.883	0.561	0.012	20	0.000	0.163
22	5.915	0.571	0.009	5.9156	0.5716	0.0096		0.0006	
24	5.95	0.58	0.012	5.9512	0.5812	0.0132		0.0012	
26	5.975	0.586	0.012	5.9768	0.5878	0.0138		0.0018	
28	6.019	0.596	0.012	6.0214	0.5984	0.0144		0.0024	
30	6.038	0.602	0.012	6.0410	0.6050	0.0150		0.0030	
32	6.013	0.602	0.006	6.0166	0.6056	0.0096		0.0036	
34	6.041	0.602	0.009	6.0452	0.6062	0.0132		0.0042	
36	6.045	0.608	0.012	6.0498	0.6128	0.0168		0.0048	
38	6.076	0.615	0.018	6.0814	0.6204	0.0234		0.0054	
40	6.079	0.624	0.018	6.0850	0.6300	0.0240	40	0.006	0.169
42	6.076	0.627	0.022	6.0830	0.6340	0.0290		0.007	
44	6.086	0.621	0.018	6.0940	0.6290	0.0260		0.008	
46	6.089	0.63	0.022	6.0980	0.6390	0.0310		0.009	
48	6.079	0.608	0.006	6.0890	0.6180	0.0160		0.010	
50	6.086	0.624	0.015	6.0970	0.6350	0.0260		0.011	
52	6.089	0.63	0.015	6.1010	0.6420	0.0270		0.012	
54	6.092	0.637	0.018	6.1050	0.6500	0.0310		0.013	
56	6.095	0.634	0.015	6.1090	0.6480	0.0290		0.014	
58	6.098	0.637	0.018	6.1130	0.6520	0.0330		0.015	
60	6.079	0.637	0.015	6.0950	0.6530	0.0310	60	0.016	0.179
62	6.092	0.637	0.015	6.1080	0.6530	0.0310		0.016	
64	6.092	0.634	0.012	6.1080	0.6500	0.0280		0.016	

Table B-1
20-Hour Constant Rate Discharge Test Data for MWBP-12
(Flow Rate = 7.5 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-12	P-1	P-2	MWBP-12 (corrected)	P-1 (corrected)	P-2 (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Cumulative Fluctuation in MWBP-09A
66	6.092	0.634	0.012	6.1080	0.6500	0.0280		0.016	
68	6.092	0.634	0.015	6.1080	0.6500	0.0310		0.016	
70	6.092	0.64	0.018	6.1080	0.6560	0.0340		0.016	
72	6.095	0.646	0.031	6.1110	0.6620	0.0470		0.016	
74	6.089	0.649	0.031	6.1050	0.6650	0.0470		0.016	
76	6.098	0.649	0.025	6.1140	0.6650	0.0410		0.016	
78	6.083	0.653	0.025	6.0990	0.6690	0.0410		0.016	
80	6.086	0.646	0.018	6.1020	0.6620	0.0340	80	0.016	0.179
82	6.073	0.646	0.015	6.0903	0.6633	0.0323		0.0173	
84	6.073	0.649	0.025	6.0916	0.6676	0.0436		0.0186	
86	6.064	0.643	0.009	6.0839	0.6629	0.0289		0.0199	
88	6.06	0.646	0.025	6.0812	0.6672	0.0462		0.0212	
90	6.073	0.649	0.028	6.0955	0.6715	0.0505		0.0225	
92	6.07	0.649	0.025	6.0938	0.6728	0.0488		0.0238	
94	6.054	0.649	0.022	6.0791	0.6741	0.0471		0.0251	
96	6.054	0.649	0.018	6.0804	0.6754	0.0444		0.0264	
98	6.038	0.653	0.022	6.0657	0.6807	0.0497		0.0277	
100	6.029	0.649	0.022	6.0580	0.6780	0.0510	100	0.029	0.192
110	6.503	0.662	0.018	6.5320	0.6910	0.0470		0.029	
120	6.535	0.675	0.022	6.5640	0.7040	0.0510	120	0.029	0.192
130	6.56	0.684	0.037	6.5890	0.7130	0.0660		0.029	
140	6.522	0.684	0.037	6.5510	0.7130	0.0660	140	0.029	0.192
150	6.506	0.687	0.037	6.5350	0.7160	0.0660		0.029	
160	6.452	0.697	0.047	6.4810	0.7260	0.0760	160	0.029	0.192
170	6.449	0.69	0.044	6.4810	0.7220	0.0760		0.032	
180	6.44	0.697	0.053	6.4750	0.7320	0.0880	180	0.035	0.198
190	6.506	0.697	0.05	6.5455	0.7365	0.0895		0.0395	
200	6.471	0.681	0.025	6.5150	0.7250	0.0690	200	0.044	0.207
210	6.449	0.687	0.034	6.4950	0.7330	0.0800		0.046	
220	6.418	0.681	0.028	6.4660	0.7290	0.0760	220	0.048	0.211
230	6.418	0.684	0.034	6.4690	0.7350	0.0850		0.051	
240	6.377	0.684	0.031	6.4310	0.7380	0.0850	240	0.054	0.217
250	6.367	0.69	0.05	6.4210	0.7440	0.1040		0.054	
260	6.579	0.697	0.05	6.6330	0.7510	0.1040	260	0.054	0.217
270	6.544	0.7	0.044	6.6030	0.7590	0.1030		0.059	
280	6.541	0.697	0.044	6.6050	0.7610	0.1080	280	0.064	0.227
290	6.538	0.697	0.053	6.5985	0.7575	0.1135		0.0605	
300	6.497	0.7	0.047	6.5540	0.7570	0.1040	300	0.057	0.220
310	6.81	0.703	0.047	6.8720	0.7650	0.1090		0.062	
320	6.863	0.709	0.05	6.9300	0.7760	0.1170	320	0.067	0.230
330	6.867	0.712	0.05	6.9355	0.7805	0.1185		0.0685	
340	6.857	0.709	0.05	6.9270	0.7790	0.1200	340	0.070	0.233
350	6.854	0.716	0.056	6.9210	0.7830	0.1230		0.067	
360	6.845	0.719	0.063	6.9090	0.7830	0.1270	360	0.064	0.227
370	6.901	0.722	0.06	6.9585	0.7795	0.1175		0.0575	
380	6.892	0.735	0.072	6.9430	0.7860	0.1230	380	0.051	0.214
390	6.92	0.738	0.082	6.9645	0.7825	0.1265		0.0445	
400	1.868	0.615	0.085	1.9060	0.6530	0.1230	400	0.038	0.201
410	5.981	0.646	0.082	6.0205	0.6855	0.1215		0.0395	
420	6.237	0.697	0.085	6.2780	0.7380	0.1260	420	0.041	0.204
430	6.683	0.719	0.088	6.7180	0.7540	0.1230		0.035	

Table B-1
20-Hour Constant Rate Discharge Test Data for MWBP-12
(Flow Rate = 7.5 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-12	P-1	P-2	MWBP-12 (corrected)	P-1 (corrected)	P-2 (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Cumulative Fluctuation in MWBP-09A
440	6.784	0.747	0.101	6.8130	0.7760	0.1300	440	0.029	0.192
450	6.845	0.757	0.104	6.8785	0.7905	0.1375		0.0335	
460	6.747	0.741	0.091	6.7850	0.7790	0.1290	460	0.038	0.201
470	6.87	0.741	0.082	6.9130	0.7840	0.1250		0.043	
480	6.924	0.741	0.082	6.9720	0.7890	0.1300	480	0.048	0.211
490	6.911	0.744	0.082	6.9590	0.7920	0.1300		0.048	
500	6.946	0.75	0.088	6.9940	0.7980	0.1360	500	0.048	0.211
510	6.977	0.763	0.104	7.0170	0.8030	0.1440		0.04	
520	7.009	0.763	0.104	7.0410	0.7950	0.1360	520	0.032	0.195
530	7.009	0.769	0.104	7.0410	0.8010	0.1360		0.032	
540	7.022	0.769	0.104	7.0540	0.8010	0.1360	540	0.032	0.195
550	7.044	0.779	0.117	7.0645	0.7995	0.1375		0.0205	
560	7.091	0.794	0.136	7.1000	0.8030	0.1450	560	0.009	0.172
570	7.11	0.798	0.139	7.1130	0.8010	0.1420		0.003	
580	7.142	0.81	0.151	7.1390	0.8070	0.1480	580	-0.003	0.160
590	7.138	0.823	0.164	7.1270	0.8120	0.1530		-0.011	
600	7.135	0.823	0.164	7.1160	0.8040	0.1450	600	-0.019	0.144
610	7.151	0.813	0.154	7.1400	0.8020	0.1430		-0.011	
620	7.164	0.807	0.148	7.1610	0.8040	0.1450	620	-0.003	0.160
630	7.145	0.81	0.151	7.1420	0.8070	0.1480		-0.003	
640	7.12	0.807	0.145	7.1170	0.8040	0.1420	640	-0.003	0.160
650	7.113	0.807	0.145	7.1115	0.8055	0.1435		-0.0015	
660	7.107	0.804	0.142	7.1070	0.8040	0.1420	660	0.000	0.163
670	7.088	0.798	0.136	7.0910	0.8010	0.1390		0.003	
680	7.116	0.801	0.142	7.1220	0.8070	0.1480	680	0.006	0.169
690	7.151	0.807	0.145	7.1555	0.8115	0.1495		0.0045	
700	7.161	0.807	0.145	7.1640	0.8100	0.1480	700	0.003	0.166
710	7.148	0.81	0.151	7.1480	0.8100	0.1510		0	
720	7.192	0.813	0.154	7.1890	0.8100	0.1510	720	-0.003	0.160
730	7.173	0.817	0.158	7.1700	0.8140	0.1550		-0.003	
740	7.183	0.817	0.158	7.1800	0.8140	0.1550	740	-0.003	0.160
750	7.189	0.817	0.154	7.1860	0.8140	0.1510		-0.003	
760	7.167	0.813	0.154	7.1640	0.8100	0.1510	760	-0.003	0.160
770	7.138	0.813	0.154	7.1365	0.8115	0.1525		-0.0015	
780	7.157	0.813	0.154	7.1570	0.8130	0.1540	780	0.000	0.163
790	7.173	0.813	0.154	7.1730	0.8130	0.1540		0	
800	7.202	0.817	0.154	7.2020	0.8170	0.1540	800	0.000	0.163
810	7.202	0.817	0.158	7.2035	0.8185	0.1595		0.0015	
820	7.17	0.813	0.154	7.1730	0.8160	0.1570	820	0.003	0.166
830	7.173	0.817	0.154	7.1760	0.8200	0.1570		0.003	
840	7.195	0.813	0.158	7.1980	0.8160	0.1610	840	0.003	0.166
850	7.167	0.813	0.154	7.1730	0.8190	0.1600		0.006	
860	7.164	0.81	0.151	7.1730	0.8190	0.1600	860	0.009	0.172
870	7.164	0.81	0.148	7.1730	0.8190	0.1570		0.009	
880	7.164	0.813	0.154	7.1730	0.8220	0.1630	880	0.009	0.172
890	7.145	0.81	0.151	7.1575	0.8225	0.1635		0.0125	
900	7.148	0.807	0.148	7.1640	0.8230	0.1640	900	0.016	0.179
910	7.73	0.81	0.148	7.7475	0.8275	0.1655		0.0175	
920	7.878	0.813	0.148	7.8970	0.8320	0.1670	920	0.019	0.182
930	7.878	0.813	0.148	7.8985	0.8335	0.1685		0.0205	
940	7.862	0.81	0.142	7.8840	0.8320	0.1640	940	0.022	0.185

Table B-1
20-Hour Constant Rate Discharge Test Data for MWBP-12
(Flow Rate = 7.5 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-12	P-1	P-2	MWBP-12 (corrected)	P-1 (corrected)	P-2 (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Cumulative Fluctuation in MWBP-09A
950	7.878	0.807	0.136	7.9065	0.8355	0.1645		0.0285	
960	7.843	0.804	0.132	7.8780	0.8390	0.1670	960	0.035	0.198
970	7.85	0.801	0.132	7.8880	0.8390	0.1700		0.038	
980	7.869	0.801	0.132	7.9100	0.8420	0.1730	980	0.041	0.204
990	7.869	0.801	0.132	7.9115	0.8435	0.1745		0.0425	
1000	7.878	0.801	0.132	7.9220	0.8450	0.1760	1000	0.044	0.207
1010	7.834	0.801	0.132	7.8800	0.8470	0.1780		0.046	
1020	7.894	0.801	0.129	7.9420	0.8490	0.1770	1020	0.048	0.211
1030	7.881	0.801	0.129	7.9305	0.8505	0.1785		0.0495	
1040	7.894	0.801	0.129	7.9450	0.8520	0.1800	1040	0.051	0.214
1050	7.9	0.801	0.132	7.9495	0.8505	0.1815		0.0495	
1060	7.938	0.801	0.132	7.9860	0.8490	0.1800	1060	0.048	0.211
1070	7.951	0.801	0.132	7.9990	0.8490	0.1800		0.048	
1080	7.995	0.801	0.136	8.0430	0.8490	0.1840	1080	0.048	0.211
1090	8.02	0.807	0.139	8.0660	0.8530	0.1850		0.046	
1100	8.087	0.807	0.142	8.1310	0.8510	0.1860	1100	0.044	0.207
1110	8.121	0.813	0.148	8.1620	0.8540	0.1890		0.041	
1120	8.159	0.813	0.148	8.1970	0.8510	0.1860	1120	0.038	0.201
1130	8.147	0.813	0.148	8.1865	0.8525	0.1875		0.0395	
1140	8.557	0.813	0.145	8.5980	0.8540	0.1860	1140	0.041	0.204
1150	8.557	0.813	0.148	8.5995	0.8555	0.1905		0.0425	
1160	8.561	0.813	0.145	8.6050	0.8570	0.1890	1160	0.044	0.207
1170	8.561	0.813	0.148	8.6035	0.8555	0.1905		0.0425	
1180	8.567	0.813	0.148	8.6080	0.8540	0.1890	1180	0.041	0.204
1190	8.567	0.813	0.145	8.6115	0.8575	0.1895		0.0445	
1200	8.567	0.81	0.145	8.6150	0.8580	0.1930	1200	0.048	0.211

Table B-2
Recovery Data for 20-Hour Constant Rate Discharge Test in MWBP-12

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet) MWBP-12	P-1	P-2
SELECTED PUMPING DATA (Q=7.5 gpm)				
0.1	0.1	1.108	0	0
1	1	2.91	0.104	-0.003
10	10	5.295	0.46	0.009
100	100	6.029	0.649	0.022
1000	1000	7.878	0.801	0.132
1100	1100	8.087	0.807	0.142
1120	1120	8.159	0.813	0.148
1140	1140	8.557	0.813	0.145
1160	1160	8.561	0.813	0.145
1180	1180	8.567	0.813	0.148
1200	1200	8.567	0.81	0.145
RECOVERY DATA				
0.0083	1200.008	8.564	0.813	0.145
0.0166	1200.017	8.564	0.813	0.145
0.025	1200.025	8.564	0.813	0.145
0.0333	1200.033	8.564	0.813	0.145
0.0416	1200.042	8.561	0.813	0.145
0.05	1200.050	8.482	0.813	0.145
0.0583	1200.058	8.365	0.813	0.145
0.0666	1200.067	8.238	0.813	0.145
0.075	1200.075	8.118	0.813	0.145
0.0833	1200.083	7.995	0.813	0.145
0.0916	1200.092	7.875	0.813	0.145
0.1	1200.100	7.748	0.813	0.145
0.1083	1200.108	7.635	0.813	0.148
0.1166	1200.117	7.527	0.813	0.145
0.125	1200.125	7.413	0.813	0.145
0.1333	1200.133	7.303	0.813	0.145
0.1416	1200.142	7.195	0.813	0.145
0.15	1200.150	7.085	0.813	0.145
0.1583	1200.158	6.98	0.813	0.145
0.1666	1200.167	6.876	0.813	0.145
0.175	1200.175	6.769	0.813	0.145
0.1833	1200.183	6.664	0.813	0.145
0.1916	1200.192	6.56	0.813	0.145
0.2	1200.200	6.462	0.813	0.145
0.2083	1200.208	6.361	0.813	0.145
0.2166	1200.217	6.263	0.813	0.145
0.225	1200.225	6.165	0.813	0.145
0.2333	1200.233	6.07	0.813	0.145
0.2416	1200.242	5.975	0.813	0.145
0.25	1200.250	5.88	0.813	0.145
0.2583	1200.258	5.788	0.81	0.145
0.2666	1200.267	5.7	0.813	0.145
0.275	1200.275	5.611	0.813	0.148
0.2833	1200.283	5.523	0.81	0.148

Table B-2
Recovery Data for 20-Hour Constant Rate Discharge Test in MWBP-12

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet) MWBP-12	P-1	P-2
0.2916	1200.292	5.441	0.813	0.148
0.3	1200.300	5.358	0.81	0.145
0.3083	1200.308	5.282	0.81	0.145
0.3166	1200.317	5.21	0.81	0.145
0.325	1200.325	5.14	0.81	0.145
0.3333	1200.333	5.074	0.81	0.148
0.35	1200.350	4.954	0.81	0.145
0.3666	1200.367	4.843	0.807	0.148
0.3833	1200.383	4.742	0.807	0.145
0.4	1200.400	4.65	0.804	0.145
0.4166	1200.417	4.561	0.804	0.148
0.4333	1200.433	4.482	0.804	0.145
0.45	1200.450	4.409	0.801	0.145
0.4666	1200.467	4.34	0.801	0.145
0.4833	1200.483	4.27	0.798	0.145
0.5	1200.500	4.207	0.798	0.145
0.5166	1200.517	4.15	0.798	0.145
0.5333	1200.533	4.093	0.798	0.145
0.55	1200.550	4.049	0.794	0.145
0.5666	1200.567	4.023	0.794	0.145
0.5833	1200.583	3.97	0.794	0.145
0.6	1200.600	3.919	0.791	0.145
0.6166	1200.617	3.865	0.791	0.145
0.6333	1200.633	3.811	0.788	0.145
0.65	1200.650	3.758	0.788	0.145
0.6666	1200.667	3.701	0.785	0.145
0.6833	1200.683	3.647	0.785	0.145
0.7	1200.700	3.59	0.782	0.145
0.7166	1200.717	3.539	0.782	0.145
0.7333	1200.733	3.489	0.782	0.145
0.75	1200.750	3.448	0.779	0.145
0.7666	1200.767	3.413	0.779	0.148
0.7833	1200.783	3.378	0.779	0.145
0.8	1200.800	3.343	0.776	0.145
0.8166	1200.817	3.311	0.776	0.148
0.8333	1200.833	3.277	0.772	0.145
0.85	1200.850	3.248	0.772	0.145
0.8666	1200.867	3.217	0.772	0.145
0.8833	1200.883	3.185	0.769	0.145
0.9	1200.900	3.156	0.769	0.145
0.9166	1200.917	3.125	0.766	0.145
0.9333	1200.933	3.096	0.766	0.145
0.95	1200.950	3.065	0.763	0.145
0.9666	1200.967	3.039	0.763	0.145
0.9833	1200.983	3.011	0.763	0.145
1	1201.0	2.982	0.76	0.145
1.2	1201.2	2.688	0.747	0.145

Table B-2
Recovery Data for 20-Hour Constant Rate Discharge Test in MWBP-12

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet) MWBP-12	P-1	P-2
1.4	1201.4	2.451	0.731	0.145
1.6	1201.6	2.245	0.716	0.145
1.8	1201.8	2.074	0.703	0.145
2	1202.0	1.925	0.687	0.145
2.2	1202.2	1.783	0.675	0.145
2.4	1202.4	1.656	0.662	0.145
2.6	1202.6	1.542	0.649	0.145
2.8	1202.8	1.444	0.637	0.145
3	1203.0	1.371	0.621	0.145
3.2	1203.2	1.32	0.612	0.148
3.4	1203.4	1.251	0.599	0.145
3.6	1203.6	1.19	0.589	0.145
3.8	1203.8	1.137	0.577	0.145
4	1204.0	1.089	0.567	0.145
4.2	1204.2	1.045	0.555	0.145
4.4	1204.4	1	0.545	0.145
4.6	1204.6	0.962	0.539	0.145
4.8	1204.8	0.924	0.526	0.142
5	1205.0	0.893	0.52	0.145
5.2	1205.2	0.867	0.511	0.142
5.4	1205.4	0.842	0.501	0.142
5.6	1205.6	0.817	0.492	0.142
5.8	1205.8	0.791	0.488	0.145
6	1206.0	0.772	0.479	0.142
6.2	1206.2	0.753	0.473	0.142
6.4	1206.4	0.738	0.466	0.142
6.6	1206.6	0.722	0.46	0.142
6.8	1206.8	0.706	0.454	0.142
7	1207.0	0.69	0.447	0.142
7.2	1207.2	0.677	0.441	0.142
7.4	1207.4	0.662	0.435	0.142
7.6	1207.6	0.652	0.429	0.142
7.8	1207.8	0.639	0.425	0.142
8	1208.0	0.627	0.429	0.142
8.2	1208.2	0.614	0.419	0.142
8.4	1208.4	0.605	0.413	0.142
8.6	1208.6	0.595	0.406	0.142
8.8	1208.8	0.586	0.4	0.142
9	1209.0	0.576	0.397	0.142
9.2	1209.2	0.567	0.391	0.142
9.4	1209.4	0.557	0.388	0.142
9.6	1209.6	0.551	0.381	0.142
9.8	1209.8	0.541	0.378	0.142
10	1210.0	0.535	0.372	0.142
12	1212.0	0.471	0.34	0.139
14	1214.0	0.424	0.309	0.136
16	1216.0	0.392	0.287	0.136

Table B-2
Recovery Data for 20-Hour Constant Rate Discharge Test in MWBP-12

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet) MWBP-12	P-1	P-2
18	1218.0	0.364	0.268	0.136
20	1220.0	0.338	0.252	0.132
22	1222.0	0.319	0.242	0.129
24	1224.0	0.304	0.23	0.129
26	1226.0	0.291	0.223	0.129
28	1228.0	0.278	0.214	0.126
30	1230.0	0.269	0.205	0.126
32	1232.0	0.259	0.198	0.123
34	1234.0	0.25	0.189	0.123
36	1236.0	0.243	0.186	0.12
38	1238.0	0.234	0.179	0.12
40	1240.0	0.231	0.176	0.12
42	1242.0	0.224	0.173	0.117
44	1244.0	0.221	0.167	0.117
46	1246.0	0.215	0.167	0.117
48	1248.0	0.212	0.164	0.117
50	1250.0	0.209	0.16	0.117
52	1252.0	0.209	0.157	0.113
54	1254.0	0.202	0.154	0.113
56	1256.0	0.199	0.151	0.113
58	1258.0	0.199	0.151	0.113
60	1260.0	0.193	0.148	0.113
62	1262.0	0.193	0.148	0.11
64	1264.0	0.19	0.145	0.11
66	1266.0	0.186	0.145	0.11
68	1268.0	0.186	0.138	0.11
70	1270.0	0.183	0.138	0.11
72	1272.0	0.18	0.135	0.107
74	1274.0	0.177	0.135	0.107
76	1276.0	0.174	0.132	0.104
78	1278.0	0.174	0.129	0.104
80	1280.0	0.171	0.129	0.104
82	1282.0	0.171	0.126	0.104
84	1284.0	0.167	0.126	0.104
86	1286.0	0.164	0.126	0.104
88	1288.0	0.164	0.123	0.101
90	1290.0	0.164	0.123	0.101
92	1292.0	0.164	0.123	0.101
94	1294.0	0.161	0.123	0.101
96	1296.0	0.161	0.119	0.101
98	1298.0	0.161	0.119	0.101
100	1300.0	0.158	0.116	0.101
110	1310.0	0.152	0.113	0.094
120	1320.0	0.145	0.11	0.091
130	1330.0	0.142	0.107	0.091

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
0	3.906	0.139	0.003	0.012	0	3.906	0.139	0.003	0.012			
0.0083	3.982	0.151	0.003	0.015	-0.003	3.982	0.151	0.003	0.015			
0.0166	4.205	0.164	0.003	0.012	0	4.205	0.164	0.003	0.012			
0.025	4.319	0.177	0.003	0.015	-0.006	4.319	0.177	0.003	0.015			
0.0333	4.389	0.189	0.003	0.019	0.003	4.389	0.189	0.003	0.019			
0.0416	4.523	0.202	0.003	0.019	-0.006	4.523	0.202	0.003	0.019			
0.05	4.662	0.214	0.003	0.012	0.003	4.662	0.214	0.003	0.012			
0.0583	4.771	0.221	0.003	0.019	0	4.771	0.221	0.003	0.019			
0.0666	4.898	0.233	0.003	0.022	-0.003	4.898	0.233	0.003	0.022			
0.075	4.949	0.246	0.003	0.019	0.003	4.949	0.246	0.003	0.019			
0.0833	5.05	0.259	0.003	0.015	0	5.05	0.259	0.003	0.015			
0.0916	5.133	0.271	0.003	0.022	0.003	5.133	0.271	0.003	0.022			
0.1	5.209	0.284	0.003	0.022	0	5.209	0.284	0.003	0.022			
0.1083	5.336	0.297	0.003	0.009	0	5.336	0.297	0.003	0.009			
0.1166	5.4	0.309	0.003	0.012	-0.003	5.4	0.309	0.003	0.012			
0.125	5.508	0.322	0.003	0.009	0.003	5.508	0.322	0.003	0.009			
0.1333	5.495	0.328	0.003	0.012	0.003	5.495	0.328	0.003	0.012			
0.1416	5.54	0.341	0.003	0.012	-0.003	5.54	0.341	0.003	0.012			
0.15	5.686	0.354	0.003	0.019	0	5.686	0.354	0.003	0.019			
0.1583	5.8	0.36	0.003	0.019	0	5.8	0.36	0.003	0.019			
0.1666	5.743	0.373	0.003	0.019	0	5.743	0.373	0.003	0.019			
0.175	5.819	0.379	0.003	0.015	0	5.819	0.379	0.003	0.015			
0.1833	5.908	0.392	0.003	0.012	-0.003	5.908	0.392	0.003	0.012			
0.1916	5.978	0.398	0.003	0.022	0.003	5.978	0.398	0.003	0.022			
0.2	6.01	0.41	0.003	0.015	0.003	6.01	0.41	0.003	0.015			
0.2083	6.093	0.417	0.003	0.015	0.003	6.093	0.417	0.003	0.015			
0.2166	6.131	0.429	0.006	0.022	0	6.131	0.429	0.006	0.022			
0.225	6.182	0.436	0.003	0.015	-0.006	6.182	0.436	0.003	0.015			
0.2333	6.232	0.448	0.006	0.025	-0.003	6.232	0.448	0.006	0.025			
0.2416	6.277	0.455	0.006	0.025	-0.003	6.277	0.455	0.006	0.025			
0.25	6.341	0.461	0.006	0.028	-0.003	6.341	0.461	0.006	0.028			
0.2583	6.385	0.467	0.006	0.025	0	6.385	0.467	0.006	0.025			
0.2666	6.41	0.48	0.006	0.028	0	6.41	0.48	0.006	0.028			
0.275	6.55	0.486	0.006	0.028	-0.003	6.55	0.486	0.006	0.028			
0.2833	6.544	0.493	0.006	0.028	0	6.544	0.493	0.006	0.028			
0.2916	6.588	0.499	0.006	0.025	-0.003	6.588	0.499	0.006	0.025			
0.3	6.684	0.512	0.006	0.022	-0.003	6.684	0.512	0.006	0.022			
0.3083	6.69	0.518	0.006	0.022	-0.003	6.69	0.518	0.006	0.022			
0.3166	6.76	0.524	0.006	0.025	0	6.76	0.524	0.006	0.025			
0.325	6.792	0.531	0.006	0.028	-0.003	6.792	0.531	0.006	0.028			
0.3333	6.849	0.537	0.006	0.025	0.003	6.849	0.537	0.006	0.025			
0.35	6.944	0.55	0.006	0.022	0.003	6.944	0.55	0.006	0.022			
0.3666	7.008	0.562	0.006	0.025	0	7.008	0.562	0.006	0.025			
0.3833	7.103	0.575	0.006	0.028	-0.003	7.103	0.575	0.006	0.028			
0.4	7.179	0.587	0.006	0.025	0.003	7.179	0.587	0.006	0.025			
0.4166	7.294	0.6	0.006	0.028	0	7.294	0.6	0.006	0.028			
0.4333	7.376	0.613	0.006	0.034	0	7.376	0.613	0.006	0.034			
0.45	7.452	0.625	0.006	0.031	0.003	7.452	0.625	0.006	0.031			
0.4666	7.579	0.638	0.009	0.031	0.003	7.579	0.638	0.009	0.031			
0.4833	7.662	0.651	0.009	0.041	-0.003	7.662	0.651	0.009	0.041			
0.5	7.732	0.657	0.009	0.031	0.003	7.732	0.657	0.009	0.031			
0.5166	7.783	0.67	0.009	0.038	0	7.783	0.67	0.009	0.038			
0.5333	7.827	0.682	0.009	0.038	0	7.827	0.682	0.009	0.038			
0.55	7.935	0.689	0.009	0.041	0	7.935	0.689	0.009	0.041			
0.5666	8.031	0.701	0.009	0.038	0.003	8.031	0.701	0.009	0.038			
0.5833	8.075	0.708	0.009	0.044	0.003	8.075	0.708	0.009	0.044			
0.6	8.037	0.72	0.009	0.044	0	8.037	0.72	0.009	0.044			
0.6166	8.081	0.727	0.012	0.041	0.003	8.081	0.727	0.012	0.041			
0.6333	8.17	0.739	0.012	0.041	0	8.17	0.739	0.012	0.041			
0.65	8.259	0.746	0.012	0.047	0	8.259	0.746	0.012	0.047			
0.6666	8.367	0.758	0.012	0.044	0.003	8.367	0.758	0.012	0.044			
0.6833	8.374	0.765	0.012	0.047	0	8.374	0.765	0.012	0.047			
0.7	8.412	0.777	0.012	0.047	-0.003	8.412	0.777	0.012	0.047			

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
0.7166	8.424	0.783	0.012	0.047	0	8.424	0.783	0.012	0.047			
0.7333	8.481	0.79	0.015	0.053	0	8.481	0.79	0.015	0.053			
0.75	8.64	0.796	0.015	0.05	0.003	8.64	0.796	0.015	0.05			
0.7666	8.723	0.802	0.015	0.05	0	8.723	0.802	0.015	0.05			
0.7833	8.723	0.809	0.015	0.053	0.003	8.723	0.809	0.015	0.053			
0.8	8.653	0.821	0.015	0.053	0	8.653	0.821	0.015	0.053			
0.8166	8.704	0.828	0.018	0.06	0.003	8.704	0.828	0.018	0.06			
0.8333	8.818	0.834	0.018	0.057	0	8.818	0.834	0.018	0.057			
0.85	8.875	0.84	0.018	0.057	0	8.875	0.84	0.018	0.057			
0.8666	8.996	0.847	0.018	0.06	0	8.996	0.847	0.018	0.06			
0.8833	8.996	0.853	0.018	0.06	0	8.996	0.853	0.018	0.06			
0.9	8.971	0.859	0.018	0.06	0.003	8.971	0.859	0.018	0.06			
0.9166	8.977	0.866	0.022	0.066	0	8.977	0.866	0.022	0.066			
0.9333	9.04	0.872	0.022	0.06	0.003	9.04	0.872	0.022	0.06			
0.95	9.167	0.872	0.022	0.063	0.003	9.167	0.872	0.022	0.063			
0.9666	9.225	0.885	0.022	0.066	0.003	9.225	0.885	0.022	0.066			
0.9833	9.205	0.891	0.022	0.063	0.006	9.205	0.891	0.022	0.063			
1	9.212	0.897	0.022	0.066	0	9.212	0.897	0.022	0.066	1	0.000	0.000
1.2	9.567	0.96	0.031	0.082	0	9.567	0.96	0.031	0.0823		0.00042	0.0003
1.4	9.745	0.992	0.037	0.098	-0.006	9.745	0.992	0.037	0.09835		0.00049	0.00035
1.6	9.853	1.024	0.044	0.101	-0.003	9.853	1.024	0.044	0.1014		0.00056	0.0004
1.8	9.936	1.043	0.05	0.101	-0.009	9.936	1.043	0.05	0.10145		0.00063	0.00045
2	9.961	1.055	0.056	0.104	-0.006	9.961	1.055	0.056	0.1045		0.0007	0.0005
2.2	10.025	1.068	0.063	0.104	-0.006	10.025	1.068	0.063	0.10455		0.00077	0.00055
2.4	10.05	1.074	0.069	0.111	-0.006	10.05	1.074	0.069	0.1116		0.00084	0.0006
2.6	10.094	1.081	0.075	0.111	-0.006	10.094	1.081	0.075	0.11165		0.00091	0.00065
2.8	10.164	1.093	0.082	0.114	-0.009	10.164	1.093	0.082	0.1147		0.00098	0.0007
3	10.12	1.093	0.088	0.12	-0.006	10.12	1.093	0.088	0.12075		0.00105	0.00075
3.2	10.139	1.1	0.094	0.123	-0.003	10.139	1.1	0.094	0.1238		0.00112	0.0008
3.4	10.152	1.1	0.097	0.123	-0.006	10.152	1.1	0.097	0.12385		0.00119	0.00085
3.6	10.177	1.106	0.104	0.123	-0.006	10.177	1.106	0.104	0.1239		0.00126	0.0009
3.8	10.209	1.106	0.11	0.127	-0.009	10.209	1.106	0.11	0.12795		0.00133	0.00095
4	10.177	1.112	0.116	0.127	-0.003	10.177	1.112	0.116	0.128		0.0014	0.001
4.2	10.158	1.112	0.12	0.127	-0.003	10.158	1.112	0.12	0.12805		0.00147	0.00105
4.4	10.196	1.112	0.123	0.13	-0.003	10.196	1.112	0.123	0.1311		0.00154	0.0011
4.6	10.19	1.112	0.126	0.13	-0.003	10.19	1.112	0.126	0.13115		0.00161	0.00115
4.8	10.266	1.112	0.129	0.13	0	10.266	1.112	0.129	0.1312		0.00168	0.0012
5	10.209	1.112	0.135	0.13	-0.006	10.209	1.112	0.135	0.13125		0.00175	0.00125
5.2	10.177	1.119	0.138	0.133	-0.003	10.177	1.119	0.138	0.1343		0.00182	0.0013
5.4	10.19	1.119	0.142	0.136	-0.009	10.19	1.119	0.142	0.13735		0.00189	0.00135
5.6	10.234	1.119	0.142	0.133	-0.006	10.234	1.119	0.142	0.1344		0.00196	0.0014
5.8	10.209	1.119	0.145	0.136	-0.006	10.209	1.119	0.145	0.13745		0.00203	0.00145
6	10.19	1.119	0.148	0.136	-0.009	10.19	1.119	0.148	0.1375		0.0021	0.0015
6.2	10.234	1.119	0.151	0.136	-0.006	10.234	1.119	0.151	0.13755		0.00217	0.00155
6.4	10.24	1.125	0.154	0.139	-0.003	10.24	1.125	0.154	0.1406		0.00224	0.0016
6.6	10.24	1.125	0.157	0.142	-0.003	10.24	1.125	0.157	0.14365		0.00231	0.00165
6.8	10.215	1.125	0.157	0.142	0	10.215	1.125	0.157	0.1437		0.00238	0.0017
7	10.215	1.125	0.161	0.139	-0.003	10.215	1.125	0.161	0.14075		0.00245	0.00175
7.2	10.221	1.125	0.164	0.146	-0.009	10.221	1.125	0.164	0.1478		0.00252	0.0018
7.4	10.234	1.125	0.164	0.142	-0.003	10.234	1.125	0.164	0.14385		0.00259	0.00185
7.6	10.259	1.125	0.167	0.142	-0.006	10.259	1.125	0.167	0.1439		0.00266	0.0019
7.8	10.259	1.131	0.17	0.139	-0.009	10.259	1.131	0.17	0.14095		0.00273	0.00195
8	10.253	1.125	0.17	0.127	-0.006	10.253	1.125	0.1728	0.129		0.0028	0.002
8.2	10.24	1.125	0.17	0.12	-0.012	10.24	1.125	0.17287	0.12205		0.00287	0.00205
8.4	10.272	1.125	0.17	0.117	-0.015	10.272	1.125	0.17294	0.1191		0.00294	0.0021
8.6	10.272	1.125	0.173	0.111	-0.012	10.272	1.125	0.17601	0.11315		0.00301	0.00215
8.8	10.285	1.131	0.173	0.101	-0.006	10.285	1.131	0.17608	0.1032		0.00308	0.0022
9	10.31	1.131	0.176	0.092	-0.006	10.31	1.131	0.17915	0.09425		0.00315	0.00225
9.2	10.278	1.131	0.176	0.085	-0.012	10.278	1.131	0.17922	0.0873		0.00322	0.0023
9.4	10.31	1.131	0.176	0.079	-0.012	10.31	1.131	0.17929	0.08135		0.00329	0.00235
9.6	10.272	1.131	0.18	0.076	-0.025	10.272	1.131	0.18336	0.0784		0.00336	0.0024
9.8	10.291	1.131	0.183	0.076	-0.012	10.291	1.131	0.18643	0.07845		0.00343	0.00245
10	10.259	1.131	0.186	0.085	-0.012	10.259	1.131	0.1895	0.0875		0.0035	0.0025

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
12	11.116	1.207	0.195	0.076	-0.012	11.116	1.207	0.1992	0.079		0.0042	0.003
14	11.148	1.22	0.205	0.057	-0.012	11.148	1.22	0.2099	0.0605		0.0049	0.0035
16	11.243	1.226	0.221	0.063	-0.012	11.243	1.226	0.2266	0.067		0.0056	0.004
18	11.243	1.232	0.23	0.069	-0.009	11.243	1.232	0.2363	0.0735		0.0063	0.0045
20	11.205	1.232	0.243	0.098	-0.009	11.210	1.237	0.25	0.103	20	0.007	0.005
22	11.218	1.232	0.243	0.076	-0.009	11.223	1.237	0.2503	0.0813		0.0073	0.0053
24	11.224	1.239	0.255	0.092	-0.009	11.230	1.245	0.2626	0.0976		0.0076	0.0056
26	11.237	1.239	0.262	0.114	-0.009	11.243	1.245	0.2699	0.1199		0.0079	0.0059
28	11.269	1.239	0.258	0.13	-0.009	11.275	1.245	0.2662	0.1362		0.0082	0.0062
30	11.231	1.245	0.262	0.158	-0.009	11.238	1.252	0.2705	0.1645		0.0085	0.0065
32	11.243	1.239	0.265	0.165	-0.012	11.250	1.246	0.2738	0.1718		0.0088	0.0068
34	11.269	1.245	0.271	0.174	-0.012	11.276	1.252	0.2801	0.1811		0.0091	0.0071
36	11.212	1.245	0.274	0.165	-0.012	11.219	1.252	0.2834	0.1724		0.0094	0.0074
38	11.313	1.245	0.281	0.152	-0.012	11.321	1.253	0.2907	0.1597		0.0097	0.0077
40	11.269	1.245	0.284	0.165	-0.012	11.277	1.253	0.294	0.173	40	0.010	0.008
42	11.275	1.251	0.287	0.174	-0.012	11.283	1.259	0.2979	0.1821		0.0109	0.0081
44	11.218	1.245	0.29	0.174	-0.015	11.226	1.253	0.3018	0.1822		0.0118	0.0082
46	11.25	1.251	0.296	0.187	-0.015	11.258	1.259	0.3087	0.1953		0.0127	0.0083
48	11.281	1.251	0.296	0.193	-0.015	11.289	1.259	0.3096	0.2014		0.0136	0.0084
50	11.319	1.258	0.3	0.187	-0.015	11.328	1.267	0.3145	0.1955		0.0145	0.0085
52	11.294	1.258	0.303	0.203	-0.015	11.303	1.267	0.3184	0.2116		0.0154	0.0086
54	11.3	1.258	0.306	0.209	-0.015	11.309	1.267	0.3223	0.2177		0.0163	0.0087
56	11.339	1.258	0.309	0.203	-0.018	11.348	1.267	0.3262	0.2118		0.0172	0.0088
58	11.319	1.258	0.309	0.203	-0.018	11.328	1.267	0.3271	0.2119		0.0181	0.0089
60	11.351	1.258	0.315	0.117	-0.015	11.360	1.267	0.334	0.126	60	0.019	0.009
62	11.345	1.258	0.312	0.095	-0.022	11.355	1.268	0.3314	0.1045		0.0194	0.0095
64	11.345	1.258	0.315	0.111	-0.018	11.355	1.268	0.3348	0.121		0.0198	0.01
66	11.345	1.258	0.322	0.114	-0.022	11.356	1.269	0.3422	0.1245		0.0202	0.0105
68	11.358	1.264	0.328	0.12	-0.018	11.369	1.275	0.3486	0.131		0.0206	0.011
70	11.389	1.27	0.325	0.114	-0.022	11.401	1.282	0.346	0.1255		0.021	0.0115
72	11.345	1.264	0.328	0.114	-0.022	11.357	1.276	0.3494	0.126		0.0214	0.012
74	11.288	1.264	0.328	0.104	-0.018	11.301	1.277	0.3498	0.1165		0.0218	0.0125
76	11.345	1.258	0.337	0.111	-0.025	11.358	1.271	0.3592	0.124		0.0222	0.013
78	11.364	1.264	0.341	0.127	-0.022	11.378	1.278	0.3636	0.1405		0.0226	0.0135
80	11.345	1.27	0.341	0.12	-0.025	11.359	1.284	0.364	0.134	80	0.023	0.014
82	11.358	1.27	0.341	0.117	-0.025	11.373	1.285	0.3646	0.1321		0.0236	0.0151
84	11.364	1.27	0.344	0.117	-0.025	11.380	1.286	0.3682	0.1332		0.0242	0.0162
86	11.358	1.27	0.347	0.111	-0.028	11.375	1.287	0.3718	0.1283		0.0248	0.0173
88	11.364	1.264	0.347	0.117	-0.028	11.382	1.282	0.3724	0.1354		0.0254	0.0184
90	11.383	1.27	0.35	0.123	-0.025	11.403	1.290	0.376	0.1425		0.026	0.0195
92	11.37	1.27	0.35	0.114	-0.025	11.391	1.291	0.3766	0.1346		0.0266	0.0206
94	11.377	1.27	0.353	0.114	-0.031	11.399	1.292	0.3802	0.1357		0.0272	0.0217
96	11.402	1.27	0.344	0.114	-0.034	11.425	1.293	0.3718	0.1368		0.0278	0.0228
98	11.434	1.277	0.356	0.127	-0.025	11.458	1.301	0.3844	0.1509		0.0284	0.0239
100	11.415	1.277	0.356	0.107	-0.028	11.440	1.302	0.385	0.132	100	0.029	0.025
105	11.396	1.277	0.363	0.111	-0.034	11.422	1.303	0.39275	0.13675		0.02975	0.02575
110	11.434	1.283	0.36	0.107	-0.034	11.461	1.310	0.3905	0.1335		0.0305	0.0265
115	11.478	1.289	0.366	0.111	-0.037	11.505	1.316	0.39725	0.13825		0.03125	0.02725
120	11.472	1.289	0.369	0.114	-0.041	11.500	1.317	0.401	0.142	120	0.032	0.028
125	11.497	1.289	0.378	0.127	-0.041	11.526	1.318	0.41075	0.1555		0.03275	0.0285
130	11.427	1.283	0.375	0.111	-0.041	11.456	1.312	0.4085	0.14		0.0335	0.029
135	11.44	1.289	0.382	0.117	-0.041	11.470	1.319	0.41625	0.1465		0.03425	0.0295
140	11.44	1.283	0.378	0.107	-0.047	11.470	1.313	0.413	0.137	140	0.035	0.030
145	11.402	1.283	0.378	0.107	-0.044	11.433	1.314	0.41375	0.13825		0.03575	0.03125
150	11.396	1.283	0.385	0.117	-0.044	11.429	1.316	0.4215	0.1495		0.0365	0.0325
155	11.44	1.283	0.385	0.111	-0.053	11.474	1.317	0.42225	0.14475		0.03725	0.03375
160	11.358	1.289	0.394	0.123	-0.05	11.393	1.324	0.432	0.158	160	0.038	0.035
165	11.377	1.289	0.397	0.123	-0.053	11.412	1.324	0.436	0.15825		0.039	0.03525
170	11.389	1.283	0.391	0.12	-0.06	11.425	1.319	0.431	0.1555		0.04	0.0355
175	11.465	1.302	0.397	0.12	-0.053	11.501	1.338	0.438	0.15575		0.041	0.03575
180	11.383	1.289	0.401	0.12	-0.053	11.419	1.325	0.443	0.156	180	0.042	0.036
185	11.377	1.289	0.394	0.114	-0.06	11.414	1.326	0.436	0.1505		0.042	0.0365
190	11.345	1.289	0.404	0.123	-0.063	11.382	1.326	0.446	0.16		0.042	0.037

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
195	11.319	1.289	0.407	0.127	-0.06	11.357	1.327	0.449	0.1645		0.042	0.0375
200	11.351	1.289	0.407	0.123	-0.069	11.389	1.327	0.449	0.161	200	0.042	0.038
205	11.358	1.289	0.404	0.12	-0.066	11.395	1.326	0.446	0.15725		0.042	0.03725
210	11.345	1.296	0.413	0.127	-0.066	11.382	1.333	0.455	0.1635		0.042	0.0365
215	11.313	1.296	0.416	0.127	-0.069	11.349	1.332	0.458	0.16275		0.042	0.03575
220	11.383	1.302	0.413	0.13	-0.069	11.418	1.337	0.455	0.165	220	0.042	0.035
225	11.446	1.308	0.42	0.133	-0.069	11.483	1.345	0.462	0.1695		0.042	0.0365
230	11.421	1.308	0.42	0.133	-0.072	11.459	1.346	0.462	0.171		0.042	0.038
235	11.478	1.314	0.429	0.142	-0.069	11.518	1.354	0.471	0.1815		0.042	0.0395
240	11.446	1.314	0.429	0.136	-0.072	11.487	1.355	0.471	0.177	240	0.042	0.041
245	11.446	1.314	0.432	0.142	-0.075	11.487	1.355	0.474	0.1825		0.042	0.0405
250	11.44	1.314	0.432	0.142	-0.079	11.480	1.354	0.474	0.182		0.042	0.04
255	11.472	1.314	0.435	0.146	-0.075	11.512	1.354	0.477	0.1855		0.042	0.0395
260	11.453	1.321	0.435	0.146	-0.079	11.492	1.360	0.477	0.185	260	0.042	0.039
265	11.44	1.314	0.438	0.142	-0.082	11.478	1.352	0.479	0.18		0.041	0.038
270	11.421	1.321	0.442	0.146	-0.079	11.458	1.358	0.482	0.183		0.04	0.037
275	11.446	1.321	0.445	0.149	-0.082	11.482	1.357	0.484	0.185		0.039	0.036
280	11.459	1.321	0.445	0.146	-0.085	11.494	1.356	0.483	0.181	280	0.038	0.035
285	11.478	1.321	0.448	0.149	-0.085	11.513	1.356	0.48525	0.1835		0.03725	0.0345
290	11.478	1.327	0.448	0.149	-0.088	11.512	1.361	0.4845	0.183		0.0365	0.034
295	11.453	1.327	0.454	0.155	-0.085	11.487	1.361	0.48975	0.1885		0.03575	0.0335
300	11.491	1.327	0.454	0.149	-0.088	11.524	1.360	0.489	0.182	300	0.035	0.033
305	11.484	1.333	0.457	0.158	-0.091	11.517	1.366	0.49125	0.1905		0.03425	0.0325
310	11.459	1.333	0.461	0.155	-0.088	11.491	1.365	0.4945	0.187		0.0335	0.032
315	11.478	1.34	0.464	0.155	-0.098	11.510	1.372	0.49675	0.1865		0.03275	0.0315
320	11.51	1.34	0.467	0.161	-0.094	11.541	1.371	0.499	0.192	320	0.032	0.031
325	11.478	1.34	0.467	0.161	-0.091	11.509	1.371	0.49825	0.19175		0.03125	0.03075
330	11.484	1.34	0.47	0.165	-0.094	11.515	1.371	0.5005	0.1955		0.0305	0.0305
335	11.465	1.34	0.473	0.165	-0.094	11.495	1.370	0.50275	0.19525		0.02975	0.03025
340	11.465	1.34	0.476	0.161	-0.094	11.495	1.370	0.505	0.191	340	0.029	0.030
345	11.472	1.34	0.476	0.161	-0.098	11.500	1.368	0.50425	0.1885		0.02825	0.0275
350	11.497	1.346	0.48	0.161	-0.094	11.522	1.371	0.5075	0.186		0.0275	0.025
355	11.554	1.359	0.486	0.171	-0.098	11.577	1.382	0.51275	0.1935		0.02675	0.0225
360	11.535	1.352	0.486	0.177	-0.098	11.555	1.372	0.512	0.197	360	0.026	0.020
365	11.548	1.359	0.489	0.171	-0.098	11.568	1.379	0.51325	0.19075		0.02425	0.01975
370	11.535	1.359	0.492	0.171	-0.098	11.555	1.379	0.5145	0.1905		0.0225	0.0195
375	11.523	1.359	0.495	0.174	-0.101	11.542	1.378	0.51575	0.19325		0.02075	0.01925
380	11.567	1.365	0.495	0.174	-0.101	11.586	1.384	0.514	0.193	380	0.019	0.019
385	11.51	1.365	0.498	0.177	-0.101	11.529	1.384	0.51625	0.19575		0.01825	0.01875
390	11.516	1.365	0.502	0.184	-0.101	11.535	1.384	0.5195	0.2025		0.0175	0.0185
395	11.548	1.365	0.505	0.184	-0.101	11.566	1.383	0.52175	0.20225		0.01675	0.01825
400	11.529	1.371	0.505	0.184	-0.101	11.547	1.389	0.521	0.202	400	0.016	0.018
405	11.567	1.371	0.508	0.187	-0.101	11.584	1.388	0.52325	0.20425		0.01525	0.01725
410	11.484	1.371	0.511	0.19	-0.101	11.501	1.388	0.5255	0.2065		0.0145	0.0165
415	11.516	1.371	0.511	0.19	-0.098	11.532	1.387	0.52475	0.20575		0.01375	0.01575
420	11.561	1.371	0.514	0.19	-0.098	11.576	1.386	0.527	0.205	420	0.013	0.015
425	11.548	1.371	0.517	0.19	-0.098	11.563	1.386	0.52925	0.2045		0.01225	0.0145
430	11.51	1.371	0.517	0.193	-0.094	11.524	1.385	0.5285	0.207		0.0115	0.014
435	11.542	1.378	0.521	0.193	-0.094	11.556	1.392	0.53175	0.2065		0.01075	0.0135
440	11.497	1.371	0.524	0.196	-0.091	11.510	1.384	0.534	0.209	440	0.010	0.013
445	11.504	1.378	0.524	0.196	-0.091	11.516	1.390	0.53325	0.20825		0.00925	0.01225
450	11.548	1.384	0.53	0.2	-0.088	11.560	1.396	0.5385	0.2115		0.0085	0.0115
455	11.58	1.39	0.53	0.203	-0.088	11.591	1.401	0.53775	0.21375		0.00775	0.01075
460	11.567	1.384	0.53	0.2	-0.085	11.577	1.394	0.537	0.21	460	0.007	0.010
465	11.561	1.384	0.533	0.203	-0.085	11.570	1.393	0.53925	0.21175		0.00625	0.00875
470	11.586	1.39	0.533	0.203	-0.082	11.594	1.398	0.5385	0.2105		0.0055	0.0075
475	11.548	1.39	0.536	0.206	-0.082	11.554	1.396	0.54075	0.21225		0.00475	0.00625
480	11.58	1.39	0.54	0.206	-0.079	11.585	1.395	0.544	0.211	480	0.004	0.005
485	11.592	1.397	0.54	0.209	-0.079	11.596	1.401	0.543	0.21325		0.003	0.00425
490	11.58	1.397	0.543	0.209	-0.075	11.584	1.401	0.545	0.2125		0.002	0.0035
495	11.611	1.397	0.546	0.212	-0.072	11.614	1.400	0.547	0.21475		0.001	0.00275
500	11.58	1.403	0.546	0.215	-0.069	11.582	1.405	0.546	0.217	500	0.000	0.002
505	11.669	1.409	0.546	0.212	-0.069	11.671	1.411	0.546	0.2135		0.000	0.0015

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
510	11.618	1.403	0.549	0.215	-0.066	11.619	1.404	0.549	0.216		0.000	0.0010
515	11.637	1.409	0.549	0.212	-0.066	11.638	1.410	0.549	0.2125		0.000	0.0005
520	11.669	1.409	0.552	0.215	-0.06	11.669	1.409	0.552	0.215	520	0.000	0.000
525	11.643	1.409	0.552	0.215	-0.06	11.642	1.408	0.55125	0.214		-0.00075	-0.0010
530	11.656	1.409	0.552	0.215	-0.06	11.654	1.407	0.5505	0.213		-0.0015	-0.002
535	11.681	1.409	0.555	0.219	-0.053	11.678	1.406	0.55275	0.216		-0.00225	-0.003
540	11.688	1.416	0.558	0.219	-0.053	11.684	1.412	0.555	0.215	540	-0.003	-0.004
545	11.669	1.416	0.558	0.222	-0.053	11.665	1.412	0.55575	0.21775		-0.00225	-0.00425
550	11.63	1.416	0.558	0.222	-0.053	11.626	1.412	0.5565	0.2175		-0.0015	-0.0045
555	11.688	1.416	0.558	0.219	-0.05	11.683	1.411	0.55725	0.21425		-0.00075	-0.00475
560	11.624	1.409	0.558	0.222	-0.05	11.619	1.404	0.558	0.217	560	0.000	-0.005
565	11.605	1.403	0.558	0.219	-0.044	11.600	1.398	0.55725	0.2135		-0.00075	-0.0055
570	11.611	1.409	0.558	0.219	-0.044	11.605	1.403	0.5565	0.213		-0.0015	-0.006
575	11.592	1.409	0.562	0.222	-0.044	11.586	1.403	0.55975	0.2155		-0.00225	-0.0065
580	11.662	1.416	0.562	0.222	-0.044	11.655	1.409	0.559	0.215	580	-0.003	-0.007
585	11.649	1.416	0.562	0.222	-0.037	11.643	1.410	0.56075	0.2155		-0.00125	-0.0065
590	11.675	1.416	0.562	0.222	-0.037	11.669	1.410	0.5625	0.216		0.0005	-0.0060
595	11.656	1.416	0.562	0.222	-0.037	11.651	1.411	0.56425	0.2165		0.00225	-0.0055
600	11.656	1.409	0.562	0.219	-0.037	11.651	1.404	0.566	0.214	600	0.004	-0.005
605	11.649	1.416	0.562	0.222	-0.034	11.645	1.412	0.56675	0.21775		0.00475	-0.00425
610	11.681	1.409	0.562	0.219	-0.031	11.678	1.406	0.5675	0.2155		0.0055	-0.0035
615	11.643	1.409	0.562	0.215	-0.031	11.640	1.406	0.56825	0.21225		0.00625	-0.00275
620	11.688	1.416	0.562	0.222	-0.031	11.686	1.414	0.569	0.22	620	0.007	-0.002
625	11.649	1.409	0.565	0.219	-0.028	11.646	1.406	0.57125	0.216		0.00625	-0.003
630	11.611	1.416	0.565	0.219	-0.028	11.607	1.412	0.5705	0.215		0.00550	-0.004
635	11.643	1.416	0.565	0.219	-0.025	11.638	1.411	0.56975	0.214		0.00475	-0.005
640	11.662	1.416	0.568	0.219	-0.025	11.656	1.410	0.572	0.213	640	0.004	-0.006
645	11.656	1.416	0.571	0.222	-0.022	11.650	1.410	0.574	0.21575		0.003	-0.00625
650	11.649	1.422	0.571	0.225	-0.018	11.643	1.416	0.573	0.2185		0.002	-0.0065
655	11.669	1.422	0.574	0.225	-0.018	11.662	1.415	0.575	0.21825		0.001	-0.00675
660	11.681	1.422	0.574	0.222	-0.022	11.674	1.415	0.574	0.215	660	0.000	-0.007
665	11.675	1.422	0.571	0.222	-0.018	11.668	1.415	0.572	0.21525		0.001	-0.00675
670	11.611	1.416	0.571	0.222	-0.018	11.605	1.410	0.573	0.2155		0.002	-0.00650
675	11.649	1.416	0.574	0.222	-0.018	11.643	1.410	0.577	0.21575		0.003	-0.00625
680	11.681	1.422	0.574	0.222	-0.015	11.675	1.416	0.578	0.216	680	0.004	-0.006
685	11.694	1.422	0.577	0.225	-0.015	11.687	1.415	0.58	0.218		0.003	-0.007
690	11.611	1.416	0.574	0.222	-0.015	11.603	1.408	0.576	0.214		0.002	-0.008
695	11.63	1.422	0.581	0.228	-0.012	11.621	1.413	0.582	0.219		0.001	-0.009
700	11.675	1.422	0.581	0.231	-0.012	11.665	1.412	0.581	0.221	700	0.000	-0.010
705	11.63	1.428	0.587	0.234	-0.009	11.620	1.418	0.58625	0.2235		-0.00075	-0.0105
710	11.675	1.428	0.584	0.231	-0.009	11.664	1.417	0.5825	0.22		-0.0015	-0.0110
715	11.643	1.428	0.584	0.231	-0.012	11.632	1.417	0.58175	0.2195		-0.00225	-0.0115
720	11.649	1.428	0.584	0.234	-0.009	11.637	1.416	0.581	0.222	720	-0.003	-0.012
725	11.669	1.428	0.584	0.231	-0.009	11.657	1.416	0.58175	0.21925		-0.00225	-0.01175
730	11.669	1.428	0.584	0.231	-0.009	11.658	1.417	0.5825	0.2195		-0.0015	-0.0115
735	11.643	1.422	0.584	0.231	-0.009	11.632	1.411	0.58325	0.21975		-0.00075	-0.01125
740	11.656	1.428	0.587	0.231	-0.009	11.645	1.417	0.587	0.22	740	0.000	-0.011
745	11.669	1.428	0.59	0.231	-0.009	11.658	1.417	0.58925	0.2195		-0.00075	-0.0115
750	11.63	1.435	0.59	0.238	-0.009	11.618	1.423	0.5885	0.226		-0.0015	-0.012
755	11.662	1.428	0.59	0.234	-0.009	11.650	1.416	0.58775	0.2215		-0.00225	-0.0125
760	11.643	1.435	0.59	0.238	-0.009	11.630	1.422	0.587	0.225	760	-0.003	-0.013
765	11.618	1.435	0.593	0.234	-0.009	11.605	1.422	0.59	0.221		-0.003	-0.013
770	11.669	1.435	0.593	0.238	-0.009	11.656	1.422	0.59	0.225		-0.003	-0.013
775	11.675	1.435	0.593	0.238	-0.012	11.662	1.422	0.59	0.225		-0.003	-0.013
780	11.675	1.435	0.593	0.238	-0.012	11.662	1.422	0.59	0.225	780	-0.003	-0.013
785	11.649	1.435	0.596	0.241	-0.009	11.636	1.422	0.59225	0.2275		-0.00375	-0.0135
790	11.624	1.435	0.596	0.241	-0.009	11.610	1.421	0.5915	0.227		-0.0045	-0.0140
795	11.675	1.441	0.596	0.241	-0.012	11.661	1.427	0.59075	0.2265		-0.00525	-0.0145
800	11.694	1.441	0.599	0.241	-0.012	11.679	1.426	0.593	0.226	800	-0.006	-0.015
805	11.669	1.441	0.603	0.244	-0.012	11.655	1.427	0.59775	0.2295		-0.00525	-0.0145
810	11.618	1.441	0.603	0.244	-0.012	11.604	1.427	0.5985	0.23		-0.0045	-0.014
815	11.681	1.441	0.603	0.244	-0.012	11.668	1.428	0.59925	0.2305		-0.00375	-0.0135
820	11.681	1.441	0.599	0.244	-0.015	11.668	1.428	0.596	0.231	820	-0.003	-0.013

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
825	11.643	1.435	0.599	0.241	-0.015	11.632	1.424	0.59775	0.22975		-0.00125	-0.01125
830	11.694	1.435	0.599	0.241	-0.015	11.685	1.426	0.5995	0.2315		0.0005	-0.0095
835	11.63	1.435	0.596	0.238	-0.015	11.622	1.427	0.59825	0.23025		0.00225	-0.00775
840	11.713	1.435	0.593	0.234	-0.018	11.707	1.429	0.597	0.228	840	0.004	-0.006
845	11.707	1.435	0.593	0.234	-0.018	11.702	1.430	0.59775	0.229		0.00475	-0.005
850	11.713	1.435	0.593	0.231	-0.018	11.709	1.431	0.5985	0.227		0.0055	-0.004
855	11.688	1.428	0.593	0.234	-0.022	11.685	1.425	0.59925	0.231		0.00625	-0.003
860	11.669	1.435	0.593	0.234	-0.022	11.667	1.433	0.6	0.232	860	0.007	-0.002
865	11.662	1.435	0.593	0.234	-0.022	11.662	1.435	0.60225	0.23425		0.00925	0.00025
870	11.7	1.435	0.593	0.231	-0.025	11.703	1.438	0.6045	0.2335		0.0115	0.0025
875	11.688	1.428	0.593	0.231	-0.028	11.693	1.433	0.60675	0.23575		0.01375	0.00475
880	11.726	1.428	0.59	0.228	-0.028	11.733	1.435	0.606	0.235	880	0.016	0.007
885	11.656	1.422	0.587	0.225	-0.031	11.663	1.429	0.60225	0.2315		0.01525	0.0065
890	11.713	1.422	0.587	0.228	-0.031	11.719	1.428	0.6015	0.234		0.0145	0.006
895	11.732	1.435	0.59	0.228	-0.031	11.738	1.441	0.60375	0.2335		0.01375	0.0055
900	11.662	1.428	0.593	0.231	-0.034	11.667	1.433	0.606	0.236	900	0.013	0.005
905	11.669	1.435	0.596	0.231	-0.034	11.674	1.440	0.609	0.23625		0.013	0.00525
910	11.732	1.435	0.596	0.231	-0.034	11.738	1.441	0.609	0.2365		0.013	0.0055
915	11.745	1.435	0.596	0.231	-0.037	11.751	1.441	0.609	0.23675		0.013	0.00575
920	11.681	1.435	0.599	0.234	-0.037	11.687	1.441	0.612	0.24	920	0.013	0.006
925	11.719	1.435	0.599	0.234	-0.041	11.725	1.441	0.61275	0.24		0.01375	0.006
930	11.713	1.435	0.596	0.231	-0.041	11.719	1.441	0.6105	0.237		0.0145	0.006
935	11.675	1.435	0.596	0.231	-0.044	11.681	1.441	0.61125	0.237		0.01525	0.006
940	11.669	1.435	0.596	0.228	-0.047	11.675	1.441	0.612	0.234	940	0.016	0.006
945	11.719	1.428	0.593	0.228	-0.047	11.726	1.435	0.60975	0.235		0.01675	0.007
950	11.662	1.435	0.596	0.231	-0.047	11.670	1.443	0.6135	0.239		0.0175	0.008
955	11.713	1.435	0.596	0.228	-0.05	11.722	1.444	0.61425	0.237		0.01825	0.009
960	11.643	1.428	0.593	0.228	-0.05	11.653	1.438	0.612	0.238	960	0.019	0.010
965	11.688	1.435	0.599	0.231	-0.05	11.699	1.446	0.619	0.24175		0.020	0.01075
970	11.707	1.435	0.599	0.234	-0.053	11.719	1.447	0.62	0.2455		0.021	0.0115
975	11.675	1.435	0.596	0.231	-0.053	11.687	1.447	0.618	0.24325		0.022	0.01225
980	11.745	1.435	0.596	0.231	-0.056	11.758	1.448	0.619	0.244	980	0.023	0.013
985	11.713	1.435	0.596	0.228	-0.056	11.727	1.449	0.619	0.2415		0.023	0.0135
990	11.751	1.435	0.596	0.228	-0.06	11.765	1.449	0.619	0.242		0.023	0.014
995	11.738	1.428	0.596	0.228	-0.06	11.753	1.443	0.619	0.2425		0.023	0.0145
1000	11.688	1.435	0.596	0.228	-0.063	11.703	1.450	0.619	0.243	1000	0.023	0.015
1005	11.656	1.428	0.599	0.231	-0.063	11.670	1.442	0.62025	0.2445		0.02125	0.0135
1010	11.662	1.435	0.603	0.234	-0.063	11.674	1.447	0.6225	0.246		0.0195	0.012
1015	11.738	1.441	0.606	0.234	-0.066	11.749	1.452	0.62375	0.2445		0.01775	0.0105
1020	11.738	1.441	0.609	0.238	-0.066	11.747	1.450	0.625	0.247	1020	0.016	0.009
1025	11.707	1.447	0.609	0.241	-0.066	11.714	1.454	0.62275	0.24775		0.01375	0.00675
1030	11.7	1.447	0.612	0.244	-0.069	11.705	1.452	0.6235	0.2485		0.0115	0.0045
1035	11.719	1.447	0.615	0.244	-0.069	11.721	1.449	0.62425	0.24625		0.00925	0.00225
1040	11.719	1.454	0.618	0.247	-0.069	11.719	1.454	0.625	0.247	1040	0.007	0.000
1045	11.732	1.454	0.622	0.25	-0.069	11.732	1.454	0.629	0.2495		0.007	-0.0005
1050	11.688	1.454	0.618	0.247	-0.072	11.687	1.453	0.625	0.246		0.007	-0.001
1055	11.726	1.454	0.622	0.247	-0.072	11.725	1.453	0.629	0.2455		0.007	-0.0015
1060	11.694	1.447	0.618	0.247	-0.072	11.692	1.445	0.625	0.245	1060	0.007	-0.002
1065	11.745	1.454	0.618	0.247	-0.075	11.743	1.452	0.625	0.245		0.007	-0.002
1070	11.719	1.454	0.622	0.247	-0.075	11.717	1.452	0.629	0.245		0.007	-0.002
1075	11.751	1.454	0.622	0.247	-0.075	11.749	1.452	0.629	0.245		0.007	-0.002
1080	11.77	1.46	0.622	0.25	-0.075	11.768	1.458	0.629	0.248	1080	0.007	-0.002
1085	11.745	1.454	0.625	0.25	-0.075	11.744	1.453	0.63275	0.249		0.00775	-0.001
1090	11.745	1.454	0.622	0.25	-0.079	11.745	1.454	0.6305	0.25		0.0085	0.000
1095	11.681	1.46	0.622	0.25	-0.079	11.682	1.461	0.63125	0.251		0.00925	0.001
1100	11.656	1.454	0.625	0.247	-0.079	11.658	1.456	0.635	0.249	1100	0.010	0.002
1105	11.713	1.454	0.625	0.25	-0.079	11.715	1.456	0.63425	0.2515		0.00925	0.002
1110	11.719	1.454	0.625	0.25	-0.079	11.720	1.455	0.6335	0.251		0.0085	0.001
1115	11.745	1.46	0.628	0.254	-0.075	11.746	1.461	0.63575	0.2545		0.00775	0.0005
1120	11.719	1.46	0.628	0.254	-0.075	11.719	1.460	0.635	0.254	1120	0.007	0.000
1125	11.751	1.46	0.631	0.257	-0.075	11.750	1.459	0.63725	0.256		0.00625	-0.001
1130	11.738	1.46	0.631	0.257	-0.075	11.736	1.458	0.6365	0.255		0.0055	-0.002
1135	11.751	1.466	0.634	0.257	-0.072	11.748	1.463	0.63875	0.254		0.00475	-0.003

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

	Transducer Readings of Drawdown (ft)									Background Readings		
Elapsed Time of Test (min)	MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
1140	11.681	1.46	0.634	0.26	-0.072	11.677	1.456	0.638	0.256	1140	0.004	-0.004
1145	11.719	1.46	0.637	0.257	-0.072	11.714	1.455	0.63925	0.25175		0.00225	-0.00525
1150	11.7	1.46	0.637	0.26	-0.072	11.694	1.454	0.6375	0.2535		0.0005	-0.0065
1155	11.669	1.466	0.641	0.263	-0.072	11.661	1.458	0.63975	0.25525		-0.00125	-0.00775
1160	11.757	1.466	0.641	0.263	-0.072	11.748	1.457	0.638	0.254	1160	-0.003	-0.009
1165	11.713	1.466	0.641	0.263	-0.072	11.704	1.457	0.63875	0.25375		-0.00225	-0.00925
1170	11.7	1.466	0.641	0.263	-0.072	11.691	1.457	0.6395	0.2535		-0.0015	-0.00950
1175	11.675	1.472	0.644	0.263	-0.072	11.665	1.462	0.64325	0.25325		-0.00075	-0.00975
1180	11.916	1.491	0.647	0.266	-0.072	11.906	1.481	0.647	0.256	1180	0.000	-0.010
1185	11.802	1.485	0.647	0.269	-0.069	11.793	1.476	0.648	0.26		0.001	-0.009
1190	11.834	1.479	0.647	0.266	-0.072	11.826	1.471	0.649	0.258		0.002	-0.008
1195	11.802	1.479	0.647	0.266	-0.069	11.795	1.472	0.65	0.259		0.003	-0.007
1200	11.77	1.479	0.644	0.266	-0.072	11.764	1.473	0.648	0.26	1200	0.004	-0.006
1205	11.802	1.479	0.647	0.266	-0.069	11.795	1.472	0.65	0.25925		0.003	-0.00675
1210	11.694	1.472	0.644	0.266	-0.069	11.687	1.465	0.646	0.2585		0.002	-0.0075
1215	11.707	1.472	0.647	0.266	-0.069	11.699	1.464	0.648	0.25775		0.001	-0.00825
1220	11.7	1.472	0.647	0.266	-0.069	11.691	1.463	0.647	0.257	1220	0.000	-0.009
1225	11.726	1.472	0.65	0.269	-0.069	11.717	1.463	0.65	0.25975		0.000	-0.00925
1230	11.688	1.479	0.65	0.269	-0.066	11.679	1.470	0.65	0.2595		0.000	-0.0095
1235	11.707	1.472	0.647	0.269	-0.066	11.697	1.462	0.647	0.25925		0.000	-0.00975
1240	11.656	1.472	0.647	0.266	-0.066	11.646	1.462	0.647	0.256	1240	0.000	-0.010
1245	11.719	1.472	0.65	0.266	-0.066	11.709	1.462	0.65	0.25575		0.000	-0.01025
1250	11.726	1.479	0.65	0.269	-0.066	11.716	1.469	0.65	0.2585		0.000	-0.0105
1255	11.726	1.472	0.647	0.273	-0.069	11.715	1.461	0.647	0.26225		0.000	-0.01075
1260	11.77	1.479	0.65	0.273	-0.069	11.759	1.468	0.65	0.262	1260	0.000	-0.011
1265	11.713	1.479	0.653	0.273	-0.063	11.702	1.468	0.65225	0.26175		-0.00075	-0.01125
1270	11.669	1.472	0.65	0.273	-0.066	11.658	1.461	0.6485	0.2615		-0.0015	-0.0115
1275	11.675	1.479	0.653	0.266	-0.063	11.663	1.467	0.65075	0.25425		-0.00225	-0.01175
1280	11.688	1.479	0.65	0.263	-0.066	11.676	1.467	0.647	0.251	1280	-0.003	-0.012
1285	11.649	1.472	0.653	0.26	-0.066	11.637	1.460	0.65	0.24775		-0.003	-0.01225
1290	11.63	1.479	0.653	0.273	-0.066	11.618	1.467	0.65	0.2605		-0.003	-0.0125
1295	11.688	1.479	0.653	0.269	-0.063	11.675	1.466	0.65	0.25625		-0.003	-0.01275
1300	11.745	1.485	0.656	0.273	-0.06	11.732	1.472	0.653	0.26	1300	-0.003	-0.013
1305	11.726	1.479	0.656	0.273	-0.063	11.713	1.466	0.653	0.26		-0.003	-0.013
1310	11.745	1.479	0.653	0.266	-0.063	11.732	1.466	0.65	0.253		-0.003	-0.013
1315	11.713	1.479	0.656	0.276	-0.06	11.700	1.466	0.653	0.263		-0.003	-0.013
1320	11.662	1.485	0.656	0.282	-0.06	11.649	1.472	0.653	0.269	1320	-0.003	-0.013
1325	11.719	1.485	0.656	0.276	-0.06	11.708	1.474	0.65375	0.26475		-0.00225	-0.01125
1330	11.656	1.479	0.656	0.273	-0.06	11.647	1.470	0.6545	0.2635		-0.0015	-0.0095
1335	11.719	1.485	0.656	0.273	-0.06	11.711	1.477	0.65525	0.26525		-0.00075	-0.00775
1340	11.688	1.485	0.656	0.279	-0.056	11.682	1.479	0.656	0.273	1340	0.000	-0.006
1345	11.707	1.485	0.656	0.273	-0.06	11.701	1.479	0.657	0.267		0.001	-0.006
1350	11.713	1.479	0.656	0.273	-0.056	11.707	1.473	0.658	0.267		0.002	-0.006
1355	11.713	1.485	0.656	0.276	-0.053	11.707	1.479	0.659	0.27		0.003	-0.006
1360	11.764	1.485	0.653	0.269	-0.053	11.758	1.479	0.657	0.263	1360	0.004	-0.006
1365	11.751	1.479	0.653	0.269	-0.053	11.746	1.474	0.65775	0.264		0.00475	-0.005
1370	11.745	1.479	0.653	0.273	-0.053	11.741	1.475	0.6585	0.269		0.0055	-0.004
1375	11.726	1.479	0.647	0.266	-0.056	11.723	1.476	0.65325	0.263		0.00625	-0.003
1380	11.719	1.479	0.647	0.263	-0.056	11.717	1.477	0.654	0.261	1380	0.007	-0.002
1385	11.738	1.485	0.653	0.266	-0.05	11.737	1.484	0.66075	0.26525		0.00775	-0.00075
1390	11.745	1.472	0.65	0.263	-0.053	11.746	1.473	0.6585	0.2635		0.0085	0.0005
1395	11.738	1.479	0.65	0.266	-0.05	11.740	1.481	0.65925	0.26775		0.00925	0.00175
1400	11.732	1.479	0.653	0.269	-0.05	11.735	1.482	0.663	0.272	1400	0.01	0.003
1405	11.751	1.485	0.653	0.266	-0.05	11.755	1.489	0.66225	0.2695		0.00925	0.0035
1410	11.764	1.479	0.653	0.263	-0.047	11.768	1.483	0.6615	0.267		0.0085	0.004
1415	11.726	1.479	0.65	0.26	-0.05	11.731	1.484	0.65775	0.2645		0.00775	0.0045
1420	11.688	1.479	0.65	0.273	-0.047	11.693	1.484	0.657	0.278	1420	0.007	0.005
1425	11.688	1.479	0.647	0.263	-0.047	11.694	1.485	0.65625	0.26875		0.00925	0.00575
1430	11.738	1.479	0.65	0.266	-0.047	11.745	1.486	0.6615	0.2725		0.0115	0.0065
1435	11.713	1.479	0.647	0.269	-0.047	11.720	1.486	0.66075	0.27625		0.01375	0.00725
1440	11.745	1.472	0.644	0.269	-0.047	11.753	1.480	0.66	0.277	1440	0.016	0.008
1445	11.751	1.479	0.647	0.266	-0.044	11.761	1.489	0.66475	0.27575		0.01775	0.00975
1450	11.707	1.466	0.644	0.257	-0.047	11.719	1.478	0.6635	0.2685		0.0195	0.0115

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
1455	11.751	1.466	0.644	0.266	-0.047	11.764	1.479	0.66525	0.27925		0.02125	0.01325
1460	11.707	1.472	0.644	0.273	-0.044	11.722	1.487	0.667	0.288	1460	0.023	0.015
1465	11.675	1.466	0.641	0.26	-0.047	11.693	1.484	0.66625	0.2775		0.02525	0.0175
1470	11.713	1.472	0.644	0.257	-0.041	11.733	1.492	0.6715	0.277		0.0275	0.02
1475	11.738	1.472	0.637	0.266	-0.044	11.761	1.495	0.66675	0.2885		0.02975	0.0225
1480	11.783	1.466	0.631	0.247	-0.041	11.808	1.491	0.663	0.272	1480	0.032	0.025
1485	11.7	1.46	0.631	0.257	-0.041	11.726	1.486	0.6655	0.283		0.0345	0.026
1490	11.789	1.454	0.625	0.241	-0.044	11.816	1.481	0.662	0.268		0.037	0.027
1495	11.738	1.46	0.622	0.238	-0.041	12.018	1.740	0.6615	0.518		0.0395	0.280
1500	11.719	1.447	0.622	0.244	-0.044	11.748	1.476	0.664	0.273	1500	0.042	0.029
1505	11.745	1.454	0.618	0.231	-0.044	11.776	1.485	0.66075	0.262		0.04275	0.031
1510	11.745	1.454	0.622	0.241	-0.037	11.778	1.487	0.6655	0.274		0.0435	0.033
1515	11.675	1.447	0.622	0.238	-0.037	11.710	1.482	0.66625	0.273		0.04425	0.035
1520	11.732	1.454	0.625	0.241	-0.034	11.769	1.491	0.67	0.278	1520	0.045	0.037
1525	11.814	1.46	0.625	0.244	-0.034	11.852	1.498	0.6715	0.282		0.0465	0.038
1530	11.738	1.447	0.625	0.244	-0.034	11.777	1.486	0.673	0.283		0.048	0.039
1535	11.726	1.454	0.622	0.241	-0.031	11.766	1.494	0.6715	0.281		0.0495	0.040
1540	11.738	1.454	0.622	0.234	-0.031	11.779	1.495	0.673	0.275	1540	0.051	0.041
1545	11.732	1.454	0.622	0.241	-0.028	11.774	1.496	0.673	0.2825		0.051	0.0415
1550	11.738	1.441	0.615	0.225	-0.034	11.780	1.483	0.666	0.267		0.051	0.0420
1555	11.757	1.454	0.622	0.234	-0.025	11.800	1.497	0.673	0.2765		0.051	0.0425
1560	11.783	1.46	0.622	0.234	-0.022	11.826	1.503	0.673	0.277	1560	0.051	0.043
1565	11.757	1.454	0.622	0.234	-0.025	11.800	1.497	0.673	0.27675		0.051	0.04275
1570	11.751	1.454	0.618	0.234	-0.022	11.794	1.497	0.669	0.2765		0.051	0.04250
1575	11.719	1.46	0.625	0.244	-0.018	11.761	1.502	0.676	0.28625		0.051	0.04225
1580	11.757	1.447	0.622	0.238	-0.018	11.799	1.489	0.673	0.28	1580	0.051	0.042
1585	11.726	1.454	0.625	0.238	-0.015	11.768	1.496	0.676	0.28		0.051	0.042
1590	11.764	1.46	0.631	0.247	-0.012	11.806	1.502	0.682	0.289		0.051	0.042
1595	11.669	1.447	0.618	0.222	-0.025	11.711	1.489	0.669	0.264		0.051	0.042
1600	11.719	1.447	0.615	0.222	-0.018	11.761	1.489	0.666	0.264	1600	0.051	0.042
1605	11.719	1.454	0.618	0.228	-0.012	11.762	1.497	0.66975	0.27075		0.05175	0.04275
1610	11.795	1.466	0.628	0.244	-0.003	11.839	1.510	0.6805	0.2875		0.0525	0.0435
1615	11.783	1.46	0.625	0.244	-0.006	11.827	1.504	0.67825	0.28825		0.05325	0.04425
1620	11.694	1.46	0.628	0.241	0	11.739	1.505	0.682	0.286	1620	0.054	0.045
1625	11.776	1.454	0.625	0.238	0	11.820	1.498	0.67825	0.282		0.05325	0.044
1630	11.789	1.46	0.628	0.241	0	11.832	1.503	0.6805	0.284		0.05250	0.043
1635	11.764	1.46	0.634	0.244	0.006	11.806	1.502	0.68575	0.286		0.05175	0.042
1640	11.776	1.466	0.628	0.238	0.009	11.817	1.507	0.679	0.279	1640	0.051	0.041
1645	11.776	1.46	0.628	0.244	0.006	11.817	1.501	0.679	0.285		0.051	0.041
1650	11.776	1.466	0.634	0.247	0.015	11.817	1.507	0.685	0.288		0.051	0.041
1655	11.732	1.46	0.631	0.241	0.009	11.773	1.501	0.682	0.282		0.051	0.041
1660	11.757	1.472	0.637	0.25	0.018	11.798	1.513	0.688	0.291	1660	0.051	0.041
1665	11.814	1.466	0.637	0.25	0.022	11.854	1.506	0.68725	0.29025		0.05025	0.04025
1670	11.726	1.466	0.634	0.244	0.022	11.766	1.506	0.6835	0.2835		0.0495	0.0395
1675	11.745	1.466	0.634	0.241	0.025	11.784	1.505	0.68275	0.27975		0.04875	0.03875
1680	11.757	1.466	0.637	0.244	0.028	11.795	1.504	0.685	0.282	1680	0.048	0.038
1685	11.783	1.466	0.637	0.247	0.028	11.821	1.504	0.685	0.285		0.048	0.038
1690	11.789	1.472	0.637	0.244	0.034	11.827	1.510	0.685	0.282		0.048	0.038
1695	11.808	1.472	0.641	0.241	0.037	11.846	1.510	0.689	0.279		0.048	0.038
1700	11.834	1.472	0.641	0.241	0.037	11.872	1.510	0.689	0.279	1700	0.048	0.038
1705	11.808	1.472	0.637	0.244	0.037	11.846	1.510	0.685	0.282		0.048	0.038
1710	11.795	1.472	0.637	0.244	0.044	11.833	1.510	0.685	0.282		0.048	0.038
1715	11.77	1.472	0.637	0.241	0.047	11.808	1.510	0.685	0.279		0.048	0.038
1720	11.77	1.472	0.641	0.247	0.05	11.808	1.510	0.689	0.285	1720	0.048	0.038
1725	11.808	1.479	0.644	0.257	0.053	11.845	1.516	0.6905	0.2935		0.0465	0.0365
1730	11.764	1.472	0.644	0.257	0.056	11.799	1.507	0.689	0.292		0.045	0.035
1735	11.757	1.479	0.647	0.26	0.063	11.791	1.513	0.6905	0.2935		0.0435	0.0335
1740	11.776	1.479	0.647	0.26	0.063	11.808	1.511	0.689	0.292	1740	0.042	0.032
1745	11.789	1.479	0.641	0.257	0.063	11.820	1.510	0.682	0.288		0.041	0.031
1750	11.846	1.479	0.65	0.263	0.066	11.876	1.509	0.69	0.293		0.040	0.030
1755	11.814	1.479	0.65	0.257	0.072	11.843	1.508	0.689	0.286		0.039	0.029
1760	11.77	1.479	0.65	0.26	0.075	11.798	1.507	0.688	0.288	1760	0.038	0.028
1765	11.776	1.479	0.65	0.26	0.075	11.803	1.506	0.6865	0.2865		0.0365	0.0265

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
1770	11.732	1.479	0.653	0.26	0.082	11.757	1.504	0.688	0.285		0.035	0.025
1775	11.713	1.485	0.653	0.263	0.085	11.737	1.509	0.6865	0.2865		0.0335	0.0235
1780	11.783	1.485	0.656	0.266	0.088	11.805	1.507	0.688	0.288	1780	0.032	0.022
1785	11.789	1.485	0.653	0.26	0.091	11.811	1.507	0.685	0.282		0.032	0.022
1790	11.713	1.479	0.656	0.266	0.094	11.735	1.501	0.688	0.288		0.032	0.022
1795	11.776	1.479	0.653	0.266	0.094	11.798	1.501	0.685	0.288		0.032	0.022
1800	11.656	1.479	0.656	0.266	0.101	11.678	1.501	0.688	0.288	1800	0.032	0.022
1805	11.77	1.485	0.659	0.269	0.104	11.792	1.507	0.691	0.291		0.032	0.022
1810	11.738	1.485	0.659	0.269	0.107	11.760	1.507	0.691	0.291		0.032	0.022
1815	11.757	1.485	0.659	0.273	0.11	11.779	1.507	0.691	0.295		0.032	0.022
1820	11.795	1.491	0.659	0.269	0.11	11.817	1.513	0.691	0.291	1820	0.032	0.022
1825	11.764	1.491	0.659	0.269	0.117	11.786	1.513	0.6895	0.29075		0.0305	0.02175
1830	11.751	1.491	0.663	0.273	0.12	11.773	1.513	0.692	0.2945		0.029	0.0215
1835	11.719	1.491	0.663	0.279	0.12	11.740	1.512	0.6905	0.30025		0.0275	0.02125
1840	11.764	1.491	0.666	0.276	0.126	11.785	1.512	0.692	0.297	1840	0.026	0.021
1845	11.764	1.491	0.666	0.276	0.129	11.784	1.511	0.69125	0.29575		0.02525	0.01975
1850	11.745	1.491	0.669	0.279	0.132	11.764	1.510	0.6935	0.2975		0.0245	0.0185
1855	11.745	1.498	0.669	0.279	0.136	11.762	1.515	0.69275	0.29625		0.02375	0.01725
1860	11.783	1.498	0.672	0.282	0.139	11.799	1.514	0.695	0.298	1860	0.023	0.016
1865	11.783	1.498	0.675	0.285	0.142	11.798	1.513	0.69625	0.3		0.02125	0.015
1870	11.776	1.504	0.678	0.288	0.145	11.790	1.518	0.6975	0.302		0.0195	0.014
1875	11.77	1.51	0.678	0.288	0.148	11.783	1.523	0.69575	0.301		0.01775	0.013
1880	11.814	1.51	0.682	0.288	0.155	11.826	1.522	0.698	0.3	1880	0.016	0.012
1885	11.802	1.51	0.685	0.292	0.158	11.812	1.520	0.69875	0.30225		0.01375	0.01025
1890	11.846	1.517	0.688	0.295	0.161	11.855	1.526	0.6995	0.3035		0.0115	0.0085
1895	11.776	1.51	0.688	0.298	0.164	11.783	1.517	0.69725	0.30475		0.00925	0.00675
1900	11.834	1.517	0.691	0.298	0.17	11.839	1.522	0.698	0.303	1900	0.007	0.005
1905	11.84	1.523	0.694	0.301	0.174	11.845	1.528	0.701	0.3055		0.007	0.0045
1910	11.795	1.517	0.694	0.301	0.177	11.799	1.521	0.701	0.305		0.007	0.0040
1915	11.865	1.523	0.694	0.301	0.18	11.869	1.527	0.701	0.3045		0.007	0.0035
1920	11.814	1.517	0.694	0.301	0.183	11.817	1.520	0.701	0.304	1920	0.007	0.003
1925	11.776	1.517	0.694	0.301	0.186	11.777	1.518	0.70025	0.30175		0.00625	0.00075
1930	11.821	1.517	0.694	0.301	0.189	11.820	1.516	0.6995	0.2995		0.0055	-0.0015
1935	11.808	1.517	0.694	0.304	0.193	11.804	1.513	0.69875	0.30025		0.00475	-0.00375
1940	11.776	1.517	0.697	0.304	0.196	11.770	1.511	0.701	0.298	1940	0.004	-0.006
1945	11.84	1.517	0.697	0.304	0.199	11.834	1.511	0.7	0.298		0.003	-0.006
1950	11.751	1.517	0.697	0.304	0.205	11.745	1.511	0.699	0.298		0.002	-0.006
1955	11.808	1.523	0.697	0.308	0.205	11.802	1.517	0.698	0.302		0.001	-0.006
1960	11.808	1.523	0.697	0.304	0.208	11.802	1.517	0.697	0.298	1960	0.000	-0.006
1965	11.859	1.529	0.701	0.308	0.208	11.852	1.522	0.701	0.301		0.000	-0.007
1970	11.859	1.523	0.701	0.308	0.212	11.851	1.515	0.701	0.3		0.000	-0.008
1975	11.834	1.523	0.701	0.308	0.215	11.825	1.514	0.701	0.299		0.000	-0.009
1980	11.77	1.523	0.701	0.308	0.215	11.760	1.513	0.701	0.298	1980	0.000	-0.010
1985	11.821	1.523	0.701	0.308	0.218	11.810	1.512	0.70025	0.29725		-0.00075	-0.01075
1990	11.77	1.523	0.701	0.311	0.221	11.759	1.512	0.6995	0.2995		-0.0015	-0.0115
1995	11.795	1.523	0.704	0.311	0.221	11.783	1.511	0.70175	0.29875		-0.00225	-0.01225
2000	11.853	1.529	0.704	0.311	0.224	11.840	1.516	0.701	0.298	2000	-0.003	-0.013
2005	11.846	1.523	0.704	0.311	0.224	11.833	1.510	0.701	0.298		-0.003	-0.013
2010	11.865	1.529	0.704	0.311	0.227	11.852	1.516	0.701	0.298		-0.003	-0.013
2015	11.827	1.523	0.704	0.311	0.227	11.814	1.510	0.701	0.298		-0.003	-0.013
2020	11.789	1.523	0.704	0.311	0.227	11.776	1.510	0.701	0.298	2020	-0.003	-0.013
2025	11.783	1.523	0.704	0.311	0.231	11.771	1.511	0.70175	0.29925		-0.00225	-0.01175
2030	11.834	1.517	0.701	0.308	0.231	11.824	1.507	0.6995	0.2975		-0.0015	-0.0105
2035	11.827	1.523	0.701	0.311	0.234	11.818	1.514	0.70025	0.30175		-0.00075	-0.00925
2040	11.821	1.517	0.701	0.308	0.231	11.813	1.509	0.701	0.3	2040	0.000	-0.008
2045	11.776	1.523	0.701	0.308	0.234	11.770	1.517	0.70275	0.3015		0.00175	-0.0065
2050	11.821	1.517	0.697	0.304	0.234	11.816	1.512	0.7005	0.299		0.0035	-0.005
2055	11.808	1.517	0.697	0.304	0.237	11.805	1.514	0.70225	0.3005		0.00525	-0.0035
2060	11.751	1.51	0.694	0.301	0.234	11.749	1.508	0.701	0.299	2060	0.007	-0.002
2065	11.789	1.51	0.691	0.298	0.234	11.789	1.510	0.70025	0.298		0.00925	0
2070	11.77	1.51	0.691	0.298	0.234	11.772	1.512	0.7025	0.3		0.0115	0.002
2075	11.789	1.504	0.688	0.295	0.234	11.793	1.508	0.70175	0.299		0.01375	0.004
2080	11.783	1.51	0.688	0.295	0.237	11.789	1.516	0.704	0.301	2080	0.016	0.006

Table B-3
36-Hour Constant Rate Discharge Data for MWBP-05B
(Flow Rate = 16 gpm)

Elapsed Time of Test (min)	Transducer Readings of Drawdown (ft) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D	MWBP-05B (corrected)	P-3(B) (corrected)	P-4(A) (corrected)	P-5(B) (corrected)	Background Readings Elapsed Time (minutes)	Relative Fluctuation in MWBP-09A	Relative Fluctuation in MWBP-09B
2085	11.834	1.504	0.688	0.292	0.234	11.840	1.510	0.704	0.298		0.016	0.006
2090	11.795	1.504	0.685	0.292	0.234	11.801	1.510	0.701	0.298		0.016	0.006
2095	11.827	1.504	0.685	0.292	0.231	11.833	1.510	0.701	0.298		0.016	0.006
2100	11.764	1.498	0.685	0.292	0.231	11.770	1.504	0.701	0.298	2100	0.016	0.006
2105	11.802	1.504	0.688	0.295	0.231	11.810	1.512	0.70475	0.303		0.01675	0.008
2110	11.834	1.504	0.688	0.292	0.231	11.844	1.514	0.7055	0.302		0.0175	0.010
2115	11.827	1.504	0.685	0.292	0.227	11.839	1.516	0.70325	0.304		0.01825	0.012
2120	11.77	1.498	0.685	0.288	0.224	11.784	1.512	0.704	0.302	2120	0.019	0.014
2125	11.726	1.498	0.682	0.288	0.224	11.741	1.513	0.70275	0.303		0.02075	0.015
2130	11.745	1.498	0.682	0.285	0.221	11.761	1.514	0.7045	0.301		0.0225	0.016
2135	11.808	1.498	0.682	0.288	0.221	11.825	1.515	0.70625	0.305		0.02425	0.017
2140	11.783	1.498	0.682	0.285	0.218	11.801	1.516	0.708	0.303	2140	0.026	0.018
2145	11.764	1.498	0.682	0.285	0.218	11.783	1.517	0.70875	0.30375		0.02675	0.01875
2150	11.776	1.498	0.682	0.282	0.215	11.796	1.518	0.7095	0.3015		0.0275	0.0195
2155	11.821	1.498	0.678	0.282	0.212	11.841	1.518	0.70625	0.30225		0.02825	0.02025
2160	11.814	1.498	0.678	0.285	0.212	11.835	1.519	0.707	0.306	2160	0.029	0.021

Table B-4
Recovery Data for 36-Hour Constant Rate Discharge Test in MWBP-05B

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D
SELECTED PUMPING DATA (Q = 16 gpm)						
0.1	0.1	5.209	0.284	0.003	0.022	0
1	1	9.212	0.897	0.022	0.066	0
10	10	10.259	1.131	0.186	0.085	-0.012
100	100	11.415	1.277	0.356	0.107	-0.028
1000	1000	11.688	1.435	0.596	0.228	-0.063
2000	2000	11.853	1.529	0.704	0.311	0.224
2100	2100	11.764	1.498	0.685	0.292	0.231
2120	2120	11.77	1.498	0.685	0.288	0.224
2140	2140	11.783	1.498	0.682	0.285	0.218
2160	2160	11.814	1.498	0.678	0.285	0.212
RECOVERY DATA						
0.0083	2160.008	11.237	1.498	0.678	0.282	0.208
0.0166	2160.017	11.104	1.491	0.678	0.282	0.208
0.025	2160.025	10.958	1.491	0.678	0.285	0.205
0.0333	2160.033	10.818	1.491	0.678	0.285	0.208
0.0416	2160.042	10.691	1.491	0.678	0.282	0.205
0.05	2160.05	10.564	1.485	0.678	0.285	0.208
0.0583	2160.058	10.412	1.479	0.678	0.285	0.208
0.0666	2160.067	10.298	1.479	0.678	0.282	0.208
0.075	2160.075	10.158	1.472	0.678	0.282	0.205
0.0833	2160.083	10.037	1.472	0.675	0.282	0.208
0.0916	2160.092	9.917	1.466	0.678	0.285	0.208
0.1	2160.1	9.783	1.46	0.678	0.279	0.208
0.1083	2160.108	9.656	1.46	0.678	0.285	0.208
0.1166	2160.117	9.536	1.454	0.675	0.285	0.212
0.125	2160.125	9.415	1.447	0.678	0.285	0.212
0.1333	2160.133	9.294	1.441	0.678	0.282	0.212
0.1416	2160.142	9.18	1.435	0.678	0.282	0.212
0.15	2160.15	9.059	1.428	0.678	0.285	0.212
0.1583	2160.158	8.951	1.422	0.678	0.285	0.212
0.1666	2160.167	8.837	1.416	0.678	0.285	0.212
0.175	2160.175	8.723	1.409	0.678	0.288	0.208
0.1833	2160.183	8.615	1.403	0.678	0.285	0.208
0.1916	2160.192	8.507	1.397	0.678	0.285	0.208
0.2	2160.2	8.399	1.384	0.675	0.282	0.212
0.2083	2160.208	8.291	1.378	0.678	0.285	0.208
0.2166	2160.217	8.183	1.371	0.678	0.285	0.208
0.225	2160.225	8.081	1.365	0.678	0.285	0.212
0.2333	2160.233	7.98	1.359	0.675	0.282	0.212
0.2416	2160.242	7.878	1.346	0.678	0.285	0.212
0.25	2160.25	7.776	1.34	0.678	0.282	0.212
0.2583	2160.258	7.681	1.333	0.678	0.282	0.212
0.2666	2160.267	7.586	1.321	0.675	0.279	0.212
0.275	2160.275	7.491	1.314	0.675	0.282	0.212
0.2833	2160.283	7.395	1.308	0.678	0.282	0.212
0.2916	2160.292	7.306	1.302	0.675	0.282	0.212

Table B-4
Recovery Data for 36-Hour Constant Rate Discharge Test in MWBP-05B

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet) MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D
0.3	2160.3	7.211	1.296	0.678	0.285	0.212
0.3083	2160.308	7.116	1.283	0.675	0.282	0.212
0.3166	2160.317	7.027	1.277	0.675	0.282	0.208
0.325	2160.325	6.944	1.27	0.675	0.282	0.208
0.3333	2160.333	6.855	1.264	0.675	0.282	0.208
0.35	2160.35	6.684	1.245	0.675	0.279	0.205
0.3666	2160.367	6.518	1.232	0.675	0.282	0.208
0.3833	2160.383	6.353	1.213	0.675	0.282	0.208
0.4	2160.4	6.194	1.201	0.675	0.282	0.208
0.4166	2160.417	6.042	1.182	0.675	0.279	0.208
0.4333	2160.433	5.889	1.169	0.675	0.279	0.208
0.45	2160.45	5.743	1.156	0.675	0.279	0.208
0.4666	2160.467	5.603	1.137	0.672	0.279	0.208
0.4833	2160.483	5.463	1.119	0.672	0.276	0.208
0.5	2160.5	5.324	1.106	0.672	0.276	0.208
0.5166	2160.517	5.19	1.093	0.672	0.276	0.208
0.5333	2160.533	5.069	1.081	0.672	0.276	0.208
0.55	2160.55	4.942	1.062	0.672	0.276	0.205
0.5666	2160.567	4.815	1.049	0.672	0.276	0.205
0.5833	2160.583	4.701	1.036	0.669	0.273	0.205
0.6	2160.6	4.586	1.017	0.669	0.276	0.205
0.6166	2160.617	4.465	1.005	0.669	0.273	0.205
0.6333	2160.633	4.364	0.992	0.669	0.273	0.208
0.65	2160.65	4.256	0.979	0.669	0.273	0.205
0.6666	2160.667	4.147	0.967	0.666	0.269	0.205
0.6833	2160.683	4.046	0.954	0.666	0.269	0.205
0.7	2160.7	3.95	0.942	0.666	0.269	0.205
0.7166	2160.717	3.855	0.929	0.666	0.269	0.205
0.7333	2160.733	3.76	0.916	0.663	0.269	0.205
0.75	2160.75	3.671	0.904	0.666	0.266	0.208
0.7666	2160.767	3.582	0.891	0.663	0.266	0.208
0.7833	2160.783	3.492	0.878	0.663	0.266	0.205
0.8	2160.8	3.41	0.866	0.663	0.266	0.208
0.8166	2160.817	3.327	0.859	0.659	0.263	0.208
0.8333	2160.833	3.244	0.847	0.659	0.26	0.205
0.85	2160.85	3.168	0.834	0.659	0.263	0.205
0.8666	2160.867	3.092	0.821	0.659	0.26	0.205
0.8833	2160.883	3.022	0.815	0.656	0.257	0.205
0.9	2160.9	2.946	0.802	0.656	0.26	0.205
0.9166	2160.917	2.882	0.79	0.656	0.26	0.205
0.9333	2160.933	2.812	0.783	0.656	0.257	0.208
0.95	2160.95	2.742	0.771	0.656	0.257	0.205
0.9666	2160.967	2.678	0.765	0.653	0.254	0.205
0.9833	2160.983	2.615	0.752	0.653	0.25	0.205
1	2161	2.558	0.746	0.653	0.254	0.208
1.2	2161.2	1.934	0.644	0.641	0.241	0.205
1.4	2161.4	1.495	0.569	0.631	0.231	0.208

Table B-4
Recovery Data for 36-Hour Constant Rate Discharge Test in MWBP-05B

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet)				
		MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D
1.6	2161.6	1.171	0.505	0.618	0.222	0.205
1.8	2161.8	0.941	0.461	0.606	0.209	0.205
2	2162	0.776	0.423	0.593	0.2	0.205
2.2	2162.2	0.655	0.392	0.584	0.196	0.205
2.4	2162.4	0.566	0.373	0.574	0.187	0.205
2.6	2162.6	0.502	0.354	0.562	0.177	0.205
2.8	2162.8	0.458	0.341	0.552	0.18	0.205
3	2163	0.426	0.328	0.546	0.171	0.205
3.2	2163.2	0.394	0.322	0.536	0.165	0.205
3.4	2163.4	0.369	0.316	0.527	0.165	0.205
3.6	2163.6	0.362	0.309	0.521	0.161	0.205
3.8	2163.8	0.35	0.309	0.514	0.158	0.208
4	2164	0.343	0.303	0.508	0.155	0.205
4.2	2164.2	0.33	0.303	0.502	0.152	0.205
4.4	2164.4	0.324	0.297	0.495	0.152	0.205
4.6	2164.6	0.324	0.297	0.492	0.155	0.205
4.8	2164.8	0.318	0.29	0.486	0.152	0.205
5	2165	0.318	0.29	0.483	0.149	0.205
5.2	2165.2	0.318	0.29	0.476	0.146	0.205
5.4	2165.4	0.311	0.29	0.473	0.149	0.205
5.6	2165.6	0.311	0.29	0.47	0.146	0.205
5.8	2165.8	0.311	0.284	0.467	0.146	0.205
6	2166	0.311	0.284	0.464	0.146	0.205
6.2	2166.2	0.305	0.284	0.461	0.146	0.205
6.4	2166.4	0.311	0.284	0.457	0.139	0.205
6.6	2166.6	0.305	0.284	0.454	0.142	0.205
6.8	2166.8	0.305	0.284	0.451	0.139	0.205
7	2167	0.299	0.284	0.451	0.139	0.205
7.2	2167.2	0.299	0.278	0.448	0.139	0.205
7.4	2167.4	0.305	0.278	0.445	0.136	0.205
7.6	2167.6	0.299	0.278	0.445	0.139	0.205
7.8	2167.8	0.299	0.278	0.442	0.139	0.205
8	2168	0.299	0.278	0.438	0.133	0.205
8.2	2168.2	0.299	0.278	0.438	0.139	0.205
8.4	2168.4	0.299	0.278	0.435	0.133	0.205
8.6	2168.6	0.299	0.278	0.435	0.139	0.205
8.8	2168.8	0.292	0.271	0.435	0.139	0.205
9	2169	0.299	0.271	0.432	0.139	0.202
9.2	2169.2	0.292	0.271	0.429	0.133	0.202
9.4	2169.4	0.292	0.271	0.429	0.139	0.205
9.6	2169.6	0.292	0.271	0.429	0.136	0.202
9.8	2169.8	0.292	0.271	0.426	0.13	0.202
10	2170	0.292	0.271	0.426	0.117	0.205
12	2172	0.286	0.265	0.416	0.13	0.202
14	2174	0.28	0.265	0.407	0.127	0.202
16	2176	0.28	0.259	0.401	0.127	0.199
18	2178	0.273	0.252	0.397	0.12	0.202

Table B-4
Recovery Data for 36-Hour Constant Rate Discharge Test in MWBP-05B

Elapsed Time (minute)	Total Test Time (minute)	Drawdown Measurements (feet)				
		MWBP-05B	P-3(B)	P-4(A)	P-5(B)	HFMW-05D
20	2180	0.267	0.252	0.391	0.117	0.199
22	2182	0.267	0.246	0.385	0.117	0.196
24	2184	0.267	0.246	0.382	0.114	0.196
26	2186	0.26	0.246	0.378	0.114	0.196
28	2188	0.26	0.246	0.375	0.114	0.196
30	2190	0.26	0.24	0.372	0.114	0.193
32	2192	0.254	0.24	0.369	0.111	0.189
34	2194	0.254	0.24	0.366	0.111	0.193
36	2196	0.254	0.233	0.363	0.107	0.189
38	2198	0.248	0.233	0.36	0.104	0.189
40	2200	0.248	0.227	0.356	0.104	0.189
42	2202	0.248	0.227	0.353	0.104	0.186
44	2204	0.241	0.227	0.35	0.104	0.186
46	2206	0.241	0.227	0.35	0.098	0.183
48	2208	0.241	0.227	0.347	0.101	0.183
50	2210	0.241	0.221	0.344	0.101	0.183
52	2212	0.241	0.221	0.344	0.101	0.183
54	2214	0.235	0.221	0.341	0.101	0.18
56	2216	0.235	0.214	0.337	0.095	0.18
58	2218	0.229	0.214	0.334	0.095	0.177
60	2220	0.229	0.214	0.334	0.095	0.177
62	2222	0.229	0.214	0.331	0.095	0.177
64	2224	0.229	0.208	0.331	0.092	0.174
66	2226	0.229	0.208	0.328	0.092	0.174
68	2228	0.222	0.208	0.325	0.092	0.17
70	2230	0.222	0.208	0.325	0.088	0.17
72	2232	0.222	0.202	0.322	0.092	0.17
74	2234	0.222	0.202	0.322	0.088	0.17
76	2236	0.216	0.202	0.318	0.088	0.167
78	2238	0.216	0.202	0.315	0.085	0.164
80	2240	0.216	0.202	0.312	0.082	0.164
82	2242	0.21	0.196	0.309	0.082	0.161
84	2244	0.21	0.196	0.309	0.082	0.161
86	2246	0.21	0.196	0.306	0.082	0.161
88	2248	0.21	0.196	0.306	0.079	0.161
90	2250	0.21	0.189	0.303	0.082	0.158
92	2252	0.203	0.189	0.303	0.079	0.158
94	2254	0.203	0.189	0.3	0.076	0.155
96	2256	0.203	0.189	0.3	0.076	0.155
98	2258	0.203	0.189	0.3	0.076	0.155
100	2260	0.203	0.189	0.296	0.076	0.151
105	2265	0.197	0.183	0.293	0.073	0.148
110	2270	0.197	0.183	0.293	0.076	0.145
115	2275	0.197	0.183	0.29	0.076	0.142
120	2280	0.19	0.177	0.287	0.069	0.139

Table B-5
Water Level Measurements in MWBP-05(A) During 36-Hour Test in MWBP-05B

Initial Depth to Water		80.48 ft		Background Readings		
Elapsed Time (min)	Depth to Water (ft)	Drawdown (ft)	Corrected Drawdown (ft)	Relative MWBP-09A Xd Reading (ft)	Test Elapsed Time (min)	Absolute MWBP-09A Xd Reading (ft)
0	80.44	-0.04	-0.04	0.000	1	0.124
65	80.53	0.05	0.069	0.019	60	0.143
95	80.53	0.05	0.079	0.029	100	0.153
125	80.54	0.06	0.092	0.032	120	0.156
155	80.55	0.07	0.108	0.038	160	0.162
185	80.56	0.08	0.122	0.042	180	0.166
215	80.57	0.09	0.132	0.042	220	0.166
245	80.58	0.1	0.142	0.042	240	0.166
275	80.6	0.12	0.158	0.038	280	0.162
305	80.61	0.13	0.165	0.035	300	0.159
335	80.62	0.14	0.169	0.029	340	0.153
365	80.64	0.16	0.186	0.026	360	0.150
395	80.65	0.17	0.186	0.016	400	0.140
425	80.67	0.19	0.203	0.013	420	0.137
455	80.68	0.2	0.207	0.007	460	0.131
485	80.68	0.2	0.204	0.004	480	0.128
515	80.7	0.22	0.220	0.000	520	0.124
545	80.71	0.23	0.227	-0.003	540	0.121
575	80.71	0.23	0.227	-0.003	580	0.121
605	80.71	0.23	0.234	0.004	600	0.128
635	80.71	0.23	0.234	0.004	640	0.128
665	80.72	0.24	0.240	0.000	660	0.124
695	80.73	0.25	0.250	0.000	700	0.124
725	80.73	0.25	0.247	-0.003	720	0.121
755	80.74	0.26	0.257	-0.003	760	0.121
785	80.74	0.26	0.257	-0.003	780	0.121
815	80.76	0.28	0.277	-0.003	820	0.121
845	80.75	0.27	0.274	0.004	840	0.128
875	80.75	0.27	0.286	0.016	880	0.140
905	80.75	0.27	0.283	0.013	900	0.137
935	80.74	0.26	0.276	0.016	940	0.140
965	80.74	0.26	0.279	0.019	960	0.143
995	80.74	0.26	0.283	0.023	1000	0.147
1025	80.75	0.27	0.286	0.016	1020	0.140
1055	80.76	0.28	0.287	0.007	1060	0.131
1085	80.78	0.3	0.307	0.007	1080	0.131
1115	80.78	0.3	0.307	0.007	1120	0.131
1145	80.77	0.29	0.294	0.004	1140	0.128
1175	80.78	0.3	0.300	0.000	1180	0.124
1205	80.77	0.29	0.294	0.004	1200	0.128
1235	80.78	0.3	0.300	0.000	1240	0.124
1265	80.78	0.3	0.300	0.000	1260	0.124
1295	80.78	0.3	0.297	-0.003	1300	0.121
1325	80.78	0.3	0.297	-0.003	1320	0.121

Table B-5
Water Level Measurements in MWBP-05(A) During 36-Hour Test in MWBP-05B

Initial Depth to Water		80.48 ft		Background Readings		
Elapsed Time (min)	Depth to Water (ft)	Drawdown (ft)	Corrected Drawdown (ft)	Relative MWBP-09A Xd Reading (ft)	Test Elapsed Time (min)	Absolute MWBP-09A Xd Reading (ft)
1355	80.78	0.3	0.304	0.004	1360	0.128
1385	80.78	0.3	0.307	0.007	1380	0.131
1415	80.78	0.3	0.307	0.007	1420	0.131
1445	80.77	0.29	0.306	0.016	1440	0.140
1475	80.76	0.28	0.312	0.032	1480	0.156
1505	80.75	0.27	0.312	0.042	1500	0.166
1535	80.75	0.27	0.321	0.051	1540	0.175
1565	80.76	0.28	0.331	0.051	1560	0.175
1595	80.76	0.28	0.331	0.051	1600	0.175
1625	80.76	0.28	0.334	0.054	1620	0.178
1655	80.77	0.29	0.341	0.051	1660	0.175
1685	80.78	0.3	0.348	0.048	1680	0.172
1715	80.78	0.3	0.348	0.048	1720	0.172
1745	80.79	0.31	0.352	0.042	1740	0.166
1775	80.81	0.33	0.362	0.032	1780	0.156
1805	80.81	0.33	0.362	0.032	1800	0.156
1835	80.83	0.35	0.376	0.026	1840	0.150
1865	80.84	0.36	0.383	0.023	1860	0.147
1895	80.85	0.37	0.377	0.007	1900	0.131
1925	80.85	0.37	0.377	0.007	1920	0.131
1955	80.85	0.37	0.370	0.000	1960	0.124
1985	80.87	0.39	0.390	0.000	1980	0.124
2015	80.87	0.39	0.387	-0.003	2020	0.121
2045	80.87	0.39	0.390	0.000	2040	0.124
2075	80.85	0.37	0.386	0.016	2080	0.140
2105	80.84	0.36	0.376	0.016	2100	0.140
2135	80.84	0.36	0.386	0.026	2140	0.150
2160	80.83	0.35	0.379	0.029	2160	0.153
Recovery Data						
2162	80.81	0.33				
2165	80.8	0.32				
2167	80.79	0.31				
2169	80.78	0.3				
2170	80.77	0.29				
2173	80.76	0.28				
2176	80.75	0.27				
2179	80.74	0.26			2180	0.156
2187	80.73	0.25				
2202	80.72	0.24			2200	0.153
2209	80.71	0.23				
2220	80.7	0.22			2220	0.156

Table B-6
Water Level Measurements in MWBP-05C During 36-Hour Test in MWBP-05B

Initial Depth to Water		80.75 ft	**Background Fluctuations in MWBP-09B**	
Elapsed Time (min)	Depth to Water (ft)	Fluctuation (ft)		Relative Change from Time 0 (ft)
5	80.72	-0.03	5	0.001
65	80.72	-0.03	65	0.01
125	80.71	-0.04	125	0.0285
185	80.70	-0.05	185	0.0365
245	80.69	-0.06	245	0.0405
305	80.70	-0.05	305	0.0325
365	80.71	-0.04	365	0.01975
425	80.74	-0.01	425	0.0145
485	80.73	-0.02	485	0.00425
545	80.76	0.01	545	-0.00425
605	80.76	0.01	605	-0.00425
665	80.76	0.01	665	-0.00675
725	80.77	0.02	725	-0.01175
785	80.77	0.02	785	-0.0135
845	80.77	0.02	845	-0.005
905	80.77	0.02	905	0.00525
965	80.75	0	965	0.01075
1025	80.75	0	1025	0.00675
1085	80.76	0.01	1085	-0.001
1145	80.75	0	1145	-0.00525
1205	80.76	0.01	1205	-0.00675
1265	80.74	-0.01	1265	-0.01125
1325	80.74	-0.01	1325	-0.01125
1385	80.74	-0.01	1385	-0.00075
1445	80.74	-0.01	1445	0.00975
1505	80.72	-0.03	1505	0.031
1565	80.72	-0.03	1565	0.04275
1625	80.72	-0.03	1625	0.044
1685	80.74	-0.01	1685	0.038
1745	80.75	0	1745	0.031
1805	80.77	0.02	1805	0.022
1865	80.81	0.06	1865	0.015
1925	80.82	0.07	1925	0.00075
1985	80.83	0.08	1985	-0.01075
2045	80.83	0.08	2045	-0.0065
2105	80.81	0.06	2105	0.008
2160	80.80	0.05	2160	0.021

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
0	0	-0.003	-0.003	0.003	-0.009	0.009	3/17, 14:00
20	20	-0.006	-0.006	0.006	-0.016	0.016	
40	40	-0.009	-0.009	0.009	-0.022	0.022	
60	60	-0.009	-0.009	0.009	-0.022	0.022	
80	80	-0.012	-0.012	0.012	-0.025	0.025	
100	100	-0.012	-0.012	0.012	-0.025	0.025	
120	120	-0.019	-0.019	0.019	-0.035	0.035	
140	140	-0.015	-0.015	0.015	-0.031	0.031	
160	160	-0.022	-0.022	0.022	-0.038	0.038	
180	180	-0.022	-0.022	0.022	-0.038	0.038	
200	200	-0.015	-0.015	0.015	-0.031	0.031	
220	220	0.012	0.012	-0.012	-0.006	0.006	
240	240	0.047	0.047	-0.047	0.031	-0.031	
260	260	0.063	0.063	-0.063	0.05	-0.05	
280	280	0.073	0.073	-0.073	0.06	-0.06	
300	300	0.082	0.082	-0.082	0.069	-0.069	
320	320	0.092	0.092	-0.092	0.076	-0.076	
340	340	0.095	0.095	-0.095	0.082	-0.082	
360	360	0.089	0.089	-0.089	0.076	-0.076	
380	380	0.079	0.079	-0.079	0.066	-0.066	
400	400	0.063	0.063	-0.063	0.05	-0.05	
420	420	0.05	0.05	-0.05	0.038	-0.038	
440	440	0.066	0.066	-0.066	0.054	-0.054	
460	460	0.066	0.066	-0.066	0.05	-0.05	
480	480	0.057	0.057	-0.057	0.041	-0.041	
500	500	0.06	0.06	-0.06	0.044	-0.044	
520	520	0.06	0.06	-0.06	0.047	-0.047	
540	540	0.054	0.054	-0.054	0.038	-0.038	
560	560	0.047	0.047	-0.047	0.031	-0.031	
580	580	0.073	0.073	-0.073	0.054	-0.054	
600	600	0.073	0.073	-0.073	0.06	-0.06	
620	620	0.086	0.086	-0.086	0.066	-0.066	
640	640	0.089	0.089	-0.089	0.073	-0.073	
660	660	0.076	0.076	-0.076	0.057	-0.057	
680	680	0.082	0.082	-0.082	0.063	-0.063	
700	700	0.07	0.07	-0.07	0.047	-0.047	
720	720	0.044	0.044	-0.044	0.025	-0.025	
740	740	0.028	0.028	-0.028	0.006	-0.006	
760	760	0.019	0.019	-0.019	-0.003	0.003	
780	780	0.022	0.022	-0.022	0	0	
800	800	0.019	0.019	-0.019	-0.003	0.003	
820	820	0.006	0.006	-0.006	-0.016	0.016	
840	840	0.012	0.012	-0.012	-0.012	0.012	
860	860	0.025	0.025	-0.025	0	0	
880	880	0.019	0.019	-0.019	-0.006	0.006	
900	900	0.035	0.035	-0.035	0.006	-0.006	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
920	920	0.019	0.019	-0.019	-0.006	0.006	
940	940	0.031	0.031	-0.031	0.006	-0.006	
960	960	0.041	0.041	-0.041	0.015	-0.015	
980	980	0.041	0.041	-0.041	0.015	-0.015	
1000	1000	0.054	0.054	-0.054	0.028	-0.028	
1020	1020	0.057	0.057	-0.057	0.028	-0.028	
1040	1040	0.06	0.06	-0.06	0.034	-0.034	
1060	1060	0.082	0.082	-0.082	0.054	-0.054	
1080	1080	0.076	0.076	-0.076	0.047	-0.047	
1100	1100	0.082	0.082	-0.082	0.054	-0.054	
1120	1120	0.079	0.079	-0.079	0.05	-0.05	
1140	1140	0.07	0.07	-0.07	0.041	-0.041	
1160	1160	0.066	0.066	-0.066	0.041	-0.041	
1180	1180	0.054	0.054	-0.054	0.025	-0.025	
1200	1200	0.038	0.038	-0.038	0.012	-0.012	
1220	1220	0.038	0.038	-0.038	0.009	-0.009	
1240	1240	0.028	0.028	-0.028	0	0	
1260	1260	0.012	0.012	-0.012	-0.016	0.016	
1280	1280	0.006	0.006	-0.006	-0.019	0.019	
1300	1300	0.003	0.003	-0.003	-0.025	0.025	
1320	1320	0.009	0.009	-0.009	-0.022	0.022	
1340	1340	0.006	0.006	-0.006	-0.022	0.022	
1360	1360	0	0	0	-0.028	0.028	
1380	1380	-0.009	-0.009	0.009	-0.035	0.035	
1400	1400	-0.009	-0.009	0.009	-0.038	0.038	
1420	1420	-0.006	-0.006	0.006	-0.035	0.035	
1440	1440	-0.012	-0.012	0.012	-0.038	0.038	3/18, 14:00
1460	1460	-0.009	-0.009	0.009	-0.035	0.035	
1480	1480	0	0	0	-0.028	0.028	
1500	1500	0.003	0.003	-0.003	-0.019	0.019	
1520	1520	0.003	0.003	-0.003	-0.022	0.022	
1540	1540	0.009	0.009	-0.009	-0.016	0.016	
1560	1560	0.006	0.006	-0.006	-0.016	0.016	
1580	1580	-0.006	-0.006	0.006	-0.025	0.025	
1600	1600	-0.012	-0.012	0.012	-0.035	0.035	
1620	1620	-0.019	-0.019	0.019	-0.041	0.041	
1640	1640	-0.025	-0.025	0.025	-0.051	0.051	
1660	1660	-0.025	-0.025	0.025	-0.047	0.047	
1680	1680	-0.028	-0.028	0.028	-0.051	0.051	
1700	1700	-0.038	-0.038	0.038	-0.06	0.06	
1720	1720	-0.028	-0.028	0.028	-0.054	0.054	
1740	1740	-0.022	-0.022	0.022	-0.044	0.044	
1760	1760	-0.019	-0.019	0.019	-0.041	0.041	
1780	1780	-0.012	-0.012	0.012	-0.035	0.035	
1800	1800	0.006	0.006	-0.006	-0.016	0.016	
1820	1820	0	0	0	-0.019	0.019	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	MWBP-09 Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	MWBP-09B Water Level Fluctuation (ft)	Comments
1840	1840	-0.012	-0.012	0.012	-0.031	0.031	
1860	1860	0.003	0.003	-0.003	-0.019	0.019	
1880	1880	0.009	0.009	-0.009	-0.012	0.012	
1900	1900	0.015	0.015	-0.015	-0.006	0.006	
1920	1920	-0.003	-0.003	0.003	-0.022	0.022	
1940	1940	-0.009	-0.009	0.009	-0.031	0.031	
1960	1960	-0.015	-0.015	0.015	-0.038	0.038	
1980	1980	-0.019	-0.019	0.019	-0.041	0.041	
2000	2000	-0.025	-0.025	0.025	-0.047	0.047	
2020	2020	-0.019	-0.019	0.019	-0.044	0.044	
2040	2040	-0.019	-0.019	0.019	-0.044	0.044	
2060	2060	-0.006	-0.006	0.006	-0.031	0.031	
2080	2080	-0.009	-0.009	0.009	-0.035	0.035	
2100	2100	-0.009	-0.009	0.009	-0.031	0.031	
2120	2120	-0.009	-0.009	0.009	-0.035	0.035	
2140	2140	-0.022	-0.022	0.022	-0.044	0.044	
2160	2160	-0.035	-0.035	0.035	-0.06	0.06	
2180	2180	-0.051	-0.051	0.051	-0.076	0.076	
2200	2200	-0.06	-0.06	0.06	-0.089	0.089	
2220	2220	-0.066	-0.066	0.066	-0.095	0.095	
2240	2240	-0.07	-0.07	0.07	-0.098	0.098	
2260	2260	-0.054	-0.054	0.054	-0.082	0.082	
2280	2280	-0.044	-0.044	0.044	-0.073	0.073	
2300	2300	-0.035	-0.035	0.035	-0.066	0.066	
2320	2320	-0.038	-0.038	0.038	-0.063	0.063	
2340	2340	-0.035	-0.035	0.035	-0.063	0.063	
2360	2360	-0.019	-0.019	0.019	-0.047	0.047	
2380	2380	-0.009	-0.009	0.009	-0.038	0.038	
2400	2400	-0.003	-0.003	0.003	-0.031	0.031	
2420	2420	-0.009	-0.009	0.009	-0.035	0.035	
2440	2440	-0.025	-0.025	0.025	-0.051	0.051	
2460	2460	-0.019	-0.019	0.019	-0.047	0.047	
2480	2480	-0.012	-0.012	0.012	-0.041	0.041	
2500	2500	-0.012	-0.012	0.012	-0.041	0.041	
2520	2520	-0.015	-0.015	0.015	-0.041	0.041	
2540	2540	-0.006	-0.006	0.006	-0.035	0.035	
2560	2560	-0.009	-0.009	0.009	-0.038	0.038	
2580	2580	-0.006	-0.006	0.006	-0.035	0.035	
2600	2600	-0.022	-0.022	0.022	-0.047	0.047	
2620	2620	-0.015	-0.015	0.015	-0.041	0.041	
2640	2640	-0.019	-0.019	0.019	-0.044	0.044	
2660	2660	-0.012	-0.012	0.012	-0.041	0.041	
2680	2680	-0.015	-0.015	0.015	-0.041	0.041	
2700	2700	-0.025	-0.025	0.025	-0.051	0.051	
2720	2720	-0.022	-0.022	0.022	-0.051	0.051	
2740	2740	-0.038	-0.038	0.038	-0.063	0.063	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
2760	2760	-0.047	-0.047	0.047	-0.07	0.07	
2780	2780	-0.051	-0.051	0.051	-0.076	0.076	
2800	2800	-0.057	-0.057	0.057	-0.082	0.082	
2820	2820	-0.073	-0.073	0.073	-0.092	0.092	
2840	2840	-0.086	-0.086	0.086	-0.108	0.108	
2860	2860	-0.095	-0.095	0.095	-0.117	0.117	
2880	2880	-0.098	-0.098	0.098	-0.121	0.121	3/19, 14:00
2900	2900	-0.095	-0.095	0.095	-0.117	0.117	
2920	2920	-0.098	-0.098	0.098	-0.121	0.121	
2940	2940	-0.095	-0.095	0.095	-0.117	0.117	
2960	2960	-0.098	-0.098	0.098	-0.121	0.121	
2980	2980	-0.095	-0.095	0.095	-0.114	0.114	
3000	3000	-0.098	-0.098	0.098	-0.117	0.117	
3020	3020	-0.105	-0.105	0.105	-0.121	0.121	
3040	3040	-0.101	-0.101	0.101	-0.121	0.121	
3060	3060	-0.092	-0.092	0.092	-0.111	0.111	
3080	3080	-0.095	-0.095	0.095	-0.111	0.111	
3100	3100	-0.095	-0.095	0.095	-0.111	0.111	
3120	3120	-0.079	-0.079	0.079	-0.095	0.095	
3140	3140	-0.076	-0.076	0.076	-0.092	0.092	
3160	3160	-0.076	-0.076	0.076	-0.092	0.092	
3180	3180	-0.073	-0.073	0.073	-0.086	0.086	
3200	3200	-0.06	-0.06	0.06	-0.073	0.073	
3220	3220	-0.06	-0.06	0.06	-0.073	0.073	
3240	3240	-0.07	-0.07	0.07	-0.079	0.079	
3260	3260	-0.124	-0.124	0.124	-0.133	0.133	
3280	3280	-0.156	-0.156	0.156	-0.168	0.168	
3300	3300	-0.114	-0.114	0.114	-0.13	0.13	
3320	3320	-0.101	-0.101	0.101	-0.114	0.114	
3340	3340	-0.079	-0.079	0.079	-0.092	0.092	
3360	3360	-0.086	-0.086	0.086	-0.098	0.098	
3380	3380	-0.095	-0.095	0.095	-0.108	0.108	
3400	3400	-0.082	-0.082	0.082	-0.095	0.095	
3420	3420	-0.073	-0.073	0.073	-0.082	0.082	
3440	3440	-0.066	-0.066	0.066	-0.076	0.076	
3460	3460	-0.076	-0.076	0.076	-0.086	0.086	
3480	3480	-0.076	-0.076	0.076	-0.086	0.086	
3500	3500	-0.076	-0.076	0.076	-0.086	0.086	
3520	3520	-0.073	-0.073	0.073	-0.082	0.082	
3540	3540	-0.089	-0.089	0.089	-0.098	0.098	
3560	3560	-0.095	-0.095	0.095	-0.108	0.108	
3580	3580	-0.101	-0.101	0.101	-0.114	0.114	
3600	3600	-0.101	-0.101	0.101	-0.114	0.114	
3620	3620	-0.095	-0.095	0.095	-0.108	0.108	
3640	3640	-0.108	-0.108	0.108	-0.117	0.117	
3660	3660	-0.111	-0.111	0.111	-0.124	0.124	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
3680	3680	-0.121	-0.121	0.121	-0.133	0.133	
3700	3700	-0.111	-0.111	0.111	-0.127	0.127	
3720	3720	-0.114	-0.114	0.114	-0.13	0.13	
3740	3740	-0.117	-0.117	0.117	-0.137	0.137	
3760	3760	-0.13	-0.13	0.13	-0.149	0.149	
3780	3780	-0.117	-0.117	0.117	-0.14	0.14	
3800	3800	-0.114	-0.114	0.114	-0.133	0.133	
3820	3820	-0.111	-0.111	0.111	-0.13	0.13	
3840	3840	-0.111	-0.111	0.111	-0.133	0.133	
3860	3860	-0.111	-0.111	0.111	-0.13	0.13	
3880	3880	-0.108	-0.108	0.108	-0.13	0.13	
3900	3900	-0.101	-0.101	0.101	-0.124	0.124	
3920	3920	-0.092	-0.092	0.092	-0.114	0.114	
3940	3940	-0.086	-0.086	0.086	-0.108	0.108	
3960	3960	-0.076	-0.076	0.076	-0.095	0.095	
3980	3980	-0.066	-0.066	0.066	-0.086	0.086	
4000	4000	-0.066	-0.066	0.066	-0.086	0.086	
4020	4020	-0.066	-0.066	0.066	-0.086	0.086	
4040	4040	-0.073	-0.073	0.073	-0.095	0.095	
4060	4060	-0.076	-0.076	0.076	-0.098	0.098	
4080	4080	-0.073	-0.073	0.073	-0.092	0.092	
4100	4100	-0.073	-0.073	0.073	-0.092	0.092	
4120	4120	-0.079	-0.079	0.079	-0.098	0.098	
4140	4140	-0.082	-0.082	0.082	-0.101	0.101	
4160	4160	-0.098	-0.098	0.098	-0.117	0.117	
4180	4180	-0.101	-0.101	0.101	-0.121	0.121	
4200	4200	-0.105	-0.105	0.105	-0.124	0.124	
4220	4220	-0.111	-0.111	0.111	-0.13	0.13	
4240	4240	-0.114	-0.114	0.114	-0.133	0.133	
4260	4260	-0.121	-0.121	0.121	-0.137	0.137	
4280	4280	-0.121	-0.121	0.121	-0.137	0.137	
0	4360	-0.07	-0.191	0.191	-0.2	0.2	
20	4380	-0.057	-0.178	0.178	-0.187	0.187	
40	4400	-0.044	-0.165	0.165	-0.175	0.175	
60	4420	-0.035	-0.156	0.156	-0.171	0.171	3/20, 15:00
80	4440	-0.028	-0.149	0.149	-0.165	0.165	
100	4460	-0.028	-0.149	0.149	-0.165	0.165	
120	4480	-0.035	-0.156	0.156	-0.171	0.171	
140	4500	-0.038	-0.159	0.159	-0.175	0.175	
160	4520	-0.044	-0.165	0.165	-0.178	0.178	
180	4540	-0.038	-0.159	0.159	-0.171	0.171	
200	4560	-0.044	-0.165	0.165	-0.178	0.178	
220	4580	-0.041	-0.162	0.162	-0.178	0.178	
240	4600	-0.044	-0.165	0.165	-0.181	0.181	
260	4620	-0.048	-0.169	0.169	-0.181	0.181	
280	4640	-0.048	-0.169	0.169	-0.184	0.184	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	MWBP-09 Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	MWBP-09B Water Level Fluctuation (ft)	Comments
300	4660	-0.038	-0.159	0.159	-0.171	0.171	
320	4680	-0.041	-0.162	0.162	-0.175	0.175	
340	4700	-0.025	-0.146	0.146	-0.162	0.162	
360	4720	-0.025	-0.146	0.146	-0.162	0.162	
380	4740	-0.032	-0.153	0.153	-0.168	0.168	
400	4760	-0.032	-0.153	0.153	-0.165	0.165	
420	4780	-0.028	-0.149	0.149	-0.165	0.165	
440	4800	-0.032	-0.153	0.153	-0.168	0.168	
460	4820	-0.032	-0.153	0.153	-0.165	0.165	
480	4840	-0.032	-0.153	0.153	-0.168	0.168	
500	4860	-0.038	-0.159	0.159	-0.175	0.175	
520	4880	-0.035	-0.156	0.156	-0.171	0.171	
540	4900	-0.028	-0.149	0.149	-0.165	0.165	
560	4920	-0.044	-0.165	0.165	-0.181	0.181	
580	4940	-0.035	-0.156	0.156	-0.171	0.171	
600	4960	-0.038	-0.159	0.159	-0.175	0.175	
620	4980	-0.044	-0.165	0.165	-0.181	0.181	
640	5000	-0.038	-0.159	0.159	-0.171	0.171	
660	5020	-0.028	-0.149	0.149	-0.162	0.162	
680	5040	-0.035	-0.156	0.156	-0.171	0.171	
700	5060	-0.032	-0.153	0.153	-0.168	0.168	
720	5080	-0.041	-0.162	0.162	-0.178	0.178	
740	5100	-0.054	-0.175	0.175	-0.19	0.19	
760	5120	-0.057	-0.178	0.178	-0.194	0.194	
780	5140	-0.064	-0.185	0.185	-0.2	0.2	
800	5160	-0.051	-0.172	0.172	-0.187	0.187	
820	5180	-0.051	-0.172	0.172	-0.184	0.184	
840	5200	-0.048	-0.169	0.169	-0.181	0.181	
860	5220	-0.041	-0.162	0.162	-0.175	0.175	
880	5240	-0.032	-0.153	0.153	-0.165	0.165	
900	5260	-0.025	-0.146	0.146	-0.162	0.162	
920	5280	-0.019	-0.14	0.14	-0.152	0.152	
940	5300	-0.009	-0.13	0.13	-0.146	0.146	
960	5320	-0.003	-0.124	0.124	-0.14	0.14	
980	5340	-0.003	-0.124	0.124	-0.14	0.14	
1000	5360	-0.003	-0.124	0.124	-0.14	0.14	
1020	5380	-0.006	-0.127	0.127	-0.14	0.14	
0	5400	0	-0.127	0.127	-0.14	0.14	3/21, 08:00
20	5420	0.009	-0.118	0.118	-0.134	0.134	
40	5440	0.006	-0.121	0.121	-0.137	0.137	
60	5460	0.015	-0.112	0.112	-0.125	0.125	
80	5480	0.019	-0.108	0.108	-0.121	0.121	
100	5500	0.019	-0.108	0.108	-0.125	0.125	
120	5520	0.015	-0.112	0.112	-0.128	0.128	
140	5540	0.022	-0.105	0.105	-0.121	0.121	
160	5560	0.019	-0.108	0.108	-0.125	0.125	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	MWBP-09 Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	MWBP-09B Water Level Fluctuation (ft)	Comments
180	5580	0.012	-0.115	0.115	-0.131	0.131	
200	5600	0.015	-0.112	0.112	-0.131	0.131	
220	5620	0.015	-0.112	0.112	-0.131	0.131	
240	5640	0.006	-0.121	0.121	-0.14	0.14	
260	5660	0	-0.127	0.127	-0.146	0.146	Begin step-drawdown test in
280	5680	-0.009	-0.136	0.136	-0.155	0.155	MWBP-12 @1230 (5670 min)
300	5700	-0.016	-0.143	0.143	-0.162	0.162	
320	5720	-0.009	-0.136	0.136	-0.159	0.159	
340	5740	-0.019	-0.146	0.146	-0.165	0.165	
360	5760	-0.032	-0.159	0.159	-0.178	0.178	
380	5780	-0.035	-0.162	0.162	-0.181	0.181	
400	5800	-0.035	-0.162	0.162	-0.181	0.181	
420	5820	-0.032	-0.159	0.159	-0.178	0.178	
440	5840	-0.038	-0.165	0.165	-0.187	0.187	
460	5860	-0.038	-0.165	0.165	-0.184	0.184	
480	5880	-0.051	-0.178	0.178	-0.197	0.197	
500	5900	-0.048	-0.175	0.175	-0.193	0.193	End step-drawdown test in
520	5920	-0.038	-0.165	0.165	-0.184	0.184	MWBP-12 @1600 (5910 min)
540	5940	-0.025	-0.152	0.152	-0.171	0.171	
560	5960	-0.006	-0.133	0.133	-0.149	0.149	
580	5980	-0.009	-0.136	0.136	-0.155	0.155	
600	6000	-0.016	-0.143	0.143	-0.159	0.159	
620	6020	-0.009	-0.136	0.136	-0.152	0.152	
640	6040	-0.009	-0.136	0.136	-0.152	0.152	
660	6060	0.003	-0.124	0.124	-0.14	0.14	
680	6080	0.006	-0.121	0.121	-0.137	0.137	
700	6100	0.009	-0.118	0.118	-0.134	0.134	
720	6120	0.019	-0.108	0.108	-0.125	0.125	
740	6140	0.025	-0.102	0.102	-0.121	0.121	
760	6160	0.031	-0.096	0.096	-0.112	0.112	
780	6180	0.031	-0.096	0.096	-0.112	0.112	
800	6200	0.031	-0.096	0.096	-0.115	0.115	
820	6220	0.028	-0.099	0.099	-0.118	0.118	
840	6240	0.019	-0.108	0.108	-0.125	0.125	
860	6260	0.019	-0.108	0.108	-0.125	0.125	
880	6280	0.022	-0.105	0.105	-0.121	0.121	
900	6300	0.015	-0.112	0.112	-0.128	0.128	
920	6320	0.019	-0.108	0.108	-0.125	0.125	
940	6340	0.022	-0.105	0.105	-0.121	0.121	
960	6360	0.025	-0.102	0.102	-0.118	0.118	
980	6380	0.028	-0.099	0.099	-0.115	0.115	
1000	6400	0.025	-0.102	0.102	-0.118	0.118	
1020	6420	0.025	-0.102	0.102	-0.118	0.118	
1040	6440	0.019	-0.108	0.108	-0.125	0.125	
1060	6460	0.006	-0.121	0.121	-0.14	0.14	
1080	6480	-0.009	-0.136	0.136	-0.152	0.152	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
1100	6500	-0.012	-0.139	0.139	-0.155	0.155	
1120	6520	-0.019	-0.146	0.146	-0.162	0.162	
1140	6540	-0.032	-0.159	0.159	-0.174	0.174	
1160	6560	-0.038	-0.165	0.165	-0.178	0.178	
1180	6580	-0.041	-0.168	0.168	-0.184	0.184	
1200	6600	-0.051	-0.178	0.178	-0.193	0.193	
1220	6620	-0.057	-0.184	0.184	-0.197	0.197	
1240	6640	-0.054	-0.181	0.181	-0.197	0.197	
1260	6660	-0.054	-0.181	0.181	-0.193	0.193	
1280	6680	-0.057	-0.184	0.184	-0.2	0.2	
1300	6700	-0.06	-0.187	0.187	-0.2	0.2	
1320	6720	-0.057	-0.184	0.184	-0.2	0.2	
1340	6740	-0.057	-0.184	0.184	-0.197	0.197	
1360	6760	-0.064	-0.191	0.191	-0.206	0.206	
1380	6780	-0.07	-0.197	0.197	-0.212	0.212	
1400	6800	-0.064	-0.191	0.191	-0.206	0.206	
1420	6820	-0.064	-0.191	0.191	-0.203	0.203	
1440	6840	-0.07	-0.197	0.197	-0.209	0.209	3/22, 08:00
1460	6860	-0.064	-0.191	0.191	-0.206	0.206	
1480	6880	-0.07	-0.197	0.197	-0.212	0.212	
1500	6900	-0.073	-0.2	0.2	-0.212	0.212	
1520	6920	-0.076	-0.203	0.203	-0.216	0.216	
1540	6940	-0.073	-0.2	0.2	-0.216	0.216	
1560	6960	-0.086	-0.213	0.213	-0.225	0.225	
1580	6980	-0.089	-0.216	0.216	-0.231	0.231	
1600	7000	-0.099	-0.226	0.226	-0.238	0.238	
1620	7020	-0.102	-0.229	0.229	-0.244	0.244	Begin step-drawdown test in
1640	7040	-0.108	-0.235	0.235	-0.247	0.247	BP-05B @1050 (7010 min)
1660	7060	-0.115	-0.242	0.242	-0.254	0.254	
1680	7080	-0.118	-0.245	0.245	-0.257	0.257	
1700	7100	-0.134	-0.261	0.261	-0.276	0.276	
1720	7120	-0.137	-0.264	0.264	-0.276	0.276	
1740	7140	-0.144	-0.271	0.271	-0.285	0.285	
1760	7160	-0.147	-0.274	0.274	-0.285	0.285	
1780	7180	-0.153	-0.28	0.28	-0.295	0.295	
1800	7200	-0.156	-0.283	0.283	-0.298	0.298	
1820	7220	-0.163	-0.29	0.29	-0.304	0.304	
1840	7240	-0.156	-0.283	0.283	-0.298	0.298	
1860	7260	-0.15	-0.277	0.277	-0.292	0.292	
1880	7280	-0.163	-0.29	0.29	-0.304	0.304	
1900	7300	-0.169	-0.296	0.296	-0.308	0.308	
1920	7320	-0.175	-0.302	0.302	-0.317	0.317	End step-drawdown test in
1940	7340	-0.182	-0.309	0.309	-0.323	0.323	BP-05B @1615 (7335 min)
1960	7360	-0.188	-0.315	0.315	-0.33	0.33	
1980	7380	-0.182	-0.309	0.309	-0.32	0.32	
0	7440	0.003	-0.306	0.306	-0.32	0.32	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
20	7460	0.022	-0.287	0.287	-0.305	0.305	
40	7480	0.028	-0.281	0.281	-0.295	0.295	
60	7500	0.031	-0.278	0.278	-0.295	0.295	
80	7520	0.035	-0.274	0.274	-0.292	0.292	
100	7540	0.031	-0.278	0.278	-0.292	0.292	
120	7560	0.035	-0.274	0.274	-0.292	0.292	
140	7580	0.038	-0.271	0.271	-0.285	0.285	
160	7600	0.038	-0.271	0.271	-0.285	0.285	
180	7620	0.044	-0.265	0.265	-0.276	0.276	
200	7640	0.035	-0.274	0.274	-0.285	0.285	
220	7660	0.031	-0.278	0.278	-0.295	0.295	
240	7680	0.044	-0.265	0.265	-0.279	0.279	
260	7700	0.044	-0.265	0.265	-0.279	0.279	
280	7720	0.038	-0.271	0.271	-0.282	0.282	
300	7740	0.044	-0.265	0.265	-0.276	0.276	
320	7760	0.047	-0.262	0.262	-0.273	0.273	
340	7780	0.038	-0.271	0.271	-0.282	0.282	
360	7800	0.031	-0.278	0.278	-0.289	0.289	
380	7820	0.019	-0.29	0.29	-0.301	0.301	
400	7840	0.035	-0.274	0.274	-0.289	0.289	
420	7860	0.028	-0.281	0.281	-0.295	0.295	
440	7880	0.028	-0.281	0.281	-0.292	0.292	
460	7900	0.047	-0.262	0.262	-0.276	0.276	
480	7920	0.079	-0.23	0.23	-0.238	0.238	
500	7940	0.092	-0.217	0.217	-0.228	0.228	
520	7960	0.092	-0.217	0.217	-0.225	0.225	
540	7980	0.076	-0.233	0.233	-0.241	0.241	
560	8000	0.082	-0.227	0.227	-0.235	0.235	
580	8020	0.07	-0.239	0.239	-0.247	0.247	
600	8040	0.089	-0.22	0.22	-0.235	0.235	
620	8060	0.095	-0.214	0.214	-0.222	0.222	
640	8080	0.108	-0.201	0.201	-0.209	0.209	
660	8100	0.111	-0.198	0.198	-0.209	0.209	
680	8120	0.124	-0.185	0.185	-0.196	0.196	
700	8140	0.121	-0.188	0.188	-0.199	0.199	
720	8160	0.111	-0.198	0.198	-0.206	0.206	
740	8180	0.13	-0.179	0.179	-0.193	0.193	
760	8200	0.143	-0.166	0.166	-0.177	0.177	
780	8220	0.146	-0.163	0.163	-0.171	0.171	
800	8240	0.146	-0.163	0.163	-0.171	0.171	
820	8260	0.146	-0.163	0.163	-0.174	0.174	
840	8280	0.14	-0.169	0.169	-0.18	0.18	3/23, 08:00
860	8300	0.14	-0.169	0.169	-0.177	0.177	
880	8320	0.14	-0.169	0.169	-0.177	0.177	
900	8340	0.143	-0.166	0.166	-0.177	0.177	
920	8360	0.146	-0.163	0.163	-0.171	0.171	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	MWBP-09 Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	MWBP-09B Water Level Fluctuation (ft)	Comments
940	8380	0.149	-0.16	0.16	-0.171	0.171	
960	8400	0.146	-0.163	0.163	-0.171	0.171	Begin constant Q test in
980	8420	0.146	-0.163	0.163	-0.171	0.171	BP-12 @1000 (8400 min)
1000	8440	0.14	-0.169	0.169	-0.177	0.177	
1020	8460	0.13	-0.179	0.179	-0.184	0.184	
1040	8480	0.13	-0.179	0.179	-0.187	0.187	
1060	8500	0.117	-0.192	0.192	-0.196	0.196	
1080	8520	0.117	-0.192	0.192	-0.199	0.199	
1100	8540	0.117	-0.192	0.192	-0.196	0.196	
1120	8560	0.117	-0.192	0.192	-0.196	0.196	
1140	8580	0.111	-0.198	0.198	-0.199	0.199	
1160	8600	0.102	-0.207	0.207	-0.209	0.209	
1180	8620	0.098	-0.211	0.211	-0.215	0.215	
1200	8640	0.092	-0.217	0.217	-0.222	0.222	
1220	8660	0.092	-0.217	0.217	-0.219	0.219	
1240	8680	0.082	-0.227	0.227	-0.228	0.228	
1260	8700	0.089	-0.22	0.22	-0.225	0.225	
1280	8720	0.079	-0.23	0.23	-0.228	0.228	
1300	8740	0.076	-0.233	0.233	-0.231	0.231	
1320	8760	0.082	-0.227	0.227	-0.228	0.228	
1340	8780	0.095	-0.214	0.214	-0.215	0.215	
1360	8800	0.108	-0.201	0.201	-0.203	0.203	
1380	8820	0.105	-0.204	0.204	-0.206	0.206	
1400	8840	0.117	-0.192	0.192	-0.19	0.19	
1420	8860	0.108	-0.201	0.201	-0.196	0.196	
1440	8880	0.098	-0.211	0.211	-0.209	0.209	
1460	8900	0.098	-0.211	0.211	-0.209	0.209	
1480	8920	0.114	-0.195	0.195	-0.193	0.193	
1500	8940	0.114	-0.195	0.195	-0.193	0.193	
1520	8960	0.137	-0.172	0.172	-0.171	0.171	
1540	8980	0.149	-0.16	0.16	-0.158	0.158	
1560	9000	0.165	-0.144	0.144	-0.139	0.139	
1580	9020	0.149	-0.16	0.16	-0.158	0.158	
1600	9040	0.149	-0.16	0.16	-0.158	0.158	
1620	9060	0.146	-0.163	0.163	-0.158	0.158	
1640	9080	0.14	-0.169	0.169	-0.165	0.165	
1660	9100	0.143	-0.166	0.166	-0.161	0.161	
1680	9120	0.149	-0.16	0.16	-0.155	0.155	
1700	9140	0.149	-0.16	0.16	-0.155	0.155	
1720	9160	0.149	-0.16	0.16	-0.158	0.158	
1740	9180	0.146	-0.163	0.163	-0.158	0.158	
1760	9200	0.146	-0.163	0.163	-0.161	0.161	
1780	9220	0.143	-0.166	0.166	-0.161	0.161	
1800	9240	0.143	-0.166	0.166	-0.165	0.165	
1820	9260	0.137	-0.172	0.172	-0.171	0.171	
1840	9280	0.137	-0.172	0.172	-0.168	0.168	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
1860	9300	0.13	-0.179	0.179	-0.177	0.177	
1880	9320	0.127	-0.182	0.182	-0.177	0.177	
1900	9340	0.124	-0.185	0.185	-0.184	0.184	
1920	9360	0.111	-0.198	0.198	-0.193	0.193	
1940	9380	0.105	-0.204	0.204	-0.199	0.199	
1960	9400	0.102	-0.207	0.207	-0.203	0.203	
1980	9420	0.098	-0.211	0.211	-0.206	0.206	
2000	9440	0.095	-0.214	0.214	-0.209	0.209	
2020	9460	0.098	-0.211	0.211	-0.209	0.209	
2040	9480	0.098	-0.211	0.211	-0.209	0.209	
2060	9500	0.102	-0.207	0.207	-0.206	0.206	
2080	9520	0.108	-0.201	0.201	-0.199	0.199	
2100	9540	0.105	-0.204	0.204	-0.203	0.203	
2120	9560	0.102	-0.207	0.207	-0.206	0.206	
2140	9580	0.105	-0.204	0.204	-0.203	0.203	
2160	9600	0.098	-0.211	0.211	-0.209	0.209	End constant Q test in
2180	9620	0.102	-0.207	0.207	-0.206	0.206	BP-12 @0600 (9600 min)
2200	9640	0.102	-0.207	0.207	-0.206	0.206	
2220	9660	0.105	-0.204	0.204	-0.203	0.203	
2240	9680	0.108	-0.201	0.201	-0.199	0.199	
2260	9700	0.111	-0.198	0.198	-0.196	0.196	
2280	9720	0.114	-0.195	0.195	-0.196	0.196	3/24, 08:00
2300	9740	0.114	-0.195	0.195	-0.196	0.196	End recovery monitoring at
2320	9760	0.114	-0.195	0.195	-0.196	0.196	08:10
0	14040	0	-0.09	0.09	-0.091	0.091	3/27, 08:00
20	14060	0	-0.09	0.09	-0.091	0.091	
40	14080	0	-0.09	0.09	-0.091	0.091	
60	14100	0	-0.09	0.09	-0.091	0.091	
80	14120	-0.003	-0.093	0.093	-0.094	0.094	
100	14140	0	-0.09	0.09	-0.091	0.091	
120	14160	-0.009	-0.099	0.099	-0.1	0.1	
140	14180	-0.012	-0.102	0.102	-0.103	0.103	
160	14200	-0.019	-0.109	0.109	-0.11	0.11	
180	14220	-0.028	-0.118	0.118	-0.119	0.119	
200	14240	-0.031	-0.121	0.121	-0.122	0.122	
220	14260	-0.034	-0.124	0.124	-0.125	0.125	Begin constant Q test in
240	14280	-0.041	-0.131	0.131	-0.132	0.132	BP-05B @1140 (14260 min)
260	14300	-0.044	-0.134	0.134	-0.135	0.135	
280	14320	-0.053	-0.143	0.143	-0.144	0.144	
300	14340	-0.057	-0.147	0.147	-0.148	0.148	
320	14360	-0.063	-0.153	0.153	-0.154	0.154	
340	14380	-0.066	-0.156	0.156	-0.157	0.157	
360	14400	-0.069	-0.159	0.159	-0.16	0.16	
380	14420	-0.072	-0.162	0.162	-0.163	0.163	
400	14440	-0.076	-0.166	0.166	-0.167	0.167	
420	14460	-0.076	-0.166	0.166	-0.167	0.167	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	MWBP-09 Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	MWBP-09 Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	MWBP-09B Water Level Fluctuation (ft)	Comments
440	14480	-0.076	-0.166	0.166	-0.167	0.167	
460	14500	-0.076	-0.166	0.166	-0.167	0.167	
480	14520	-0.076	-0.166	0.166	-0.167	0.167	
500	14540	-0.072	-0.162	0.162	-0.163	0.163	
520	14560	-0.069	-0.159	0.159	-0.16	0.16	
540	14580	-0.066	-0.156	0.156	-0.157	0.157	
560	14600	-0.063	-0.153	0.153	-0.154	0.154	
580	14620	-0.06	-0.15	0.15	-0.151	0.151	
600	14640	-0.053	-0.143	0.143	-0.144	0.144	
620	14660	-0.05	-0.14	0.14	-0.141	0.141	
640	14680	-0.047	-0.137	0.137	-0.138	0.138	
660	14700	-0.044	-0.134	0.134	-0.135	0.135	
680	14720	-0.041	-0.131	0.131	-0.132	0.132	
700	14740	-0.038	-0.128	0.128	-0.129	0.129	
720	14760	-0.034	-0.124	0.124	-0.125	0.125	
740	14780	-0.034	-0.124	0.124	-0.125	0.125	
760	14800	-0.031	-0.121	0.121	-0.122	0.122	
780	14820	-0.034	-0.124	0.124	-0.125	0.125	
800	14840	-0.031	-0.121	0.121	-0.122	0.122	
820	14860	-0.038	-0.128	0.128	-0.129	0.129	
840	14880	-0.041	-0.131	0.131	-0.132	0.132	
860	14900	-0.038	-0.128	0.128	-0.129	0.129	
880	14920	-0.034	-0.124	0.124	-0.125	0.125	
900	14940	-0.038	-0.128	0.128	-0.129	0.129	
920	14960	-0.034	-0.124	0.124	-0.125	0.125	
940	14980	-0.031	-0.121	0.121	-0.122	0.122	
960	15000	-0.034	-0.124	0.124	-0.125	0.125	
980	15020	-0.031	-0.121	0.121	-0.122	0.122	
1000	15040	-0.031	-0.121	0.121	-0.122	0.122	
1020	15060	-0.028	-0.118	0.118	-0.119	0.119	
1040	15080	-0.031	-0.121	0.121	-0.122	0.122	
1060	15100	-0.038	-0.128	0.128	-0.129	0.129	
1080	15120	-0.041	-0.131	0.131	-0.132	0.132	
1100	15140	-0.05	-0.14	0.14	-0.141	0.141	
1120	15160	-0.047	-0.137	0.137	-0.138	0.138	
1140	15180	-0.047	-0.137	0.137	-0.138	0.138	
1160	15200	-0.05	-0.14	0.14	-0.141	0.141	
1180	15220	-0.053	-0.143	0.143	-0.144	0.144	
1200	15240	-0.057	-0.147	0.147	-0.148	0.148	
1220	15260	-0.057	-0.147	0.147	-0.148	0.148	
1240	15280	-0.05	-0.14	0.14	-0.141	0.141	
1260	15300	-0.041	-0.131	0.131	-0.132	0.132	
1280	15320	-0.041	-0.131	0.131	-0.132	0.132	
1300	15340	-0.041	-0.131	0.131	-0.132	0.132	
1320	15360	-0.044	-0.134	0.134	-0.135	0.135	
1340	15380	-0.041	-0.131	0.131	-0.132	0.132	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
1360	15400	-0.038	-0.128	0.128	-0.129	0.129	
1380	15420	-0.031	-0.121	0.121	-0.122	0.122	
1400	15440	-0.034	-0.124	0.124	-0.125	0.125	
1420	15460	-0.038	-0.128	0.128	-0.129	0.129	
1440	15480	-0.034	-0.124	0.124	-0.125	0.125	3/28, 08:00
1460	15500	-0.034	-0.124	0.124	-0.125	0.125	
1480	15520	-0.034	-0.124	0.124	-0.125	0.125	
1500	15540	-0.031	-0.121	0.121	-0.122	0.122	
1520	15560	-0.031	-0.121	0.121	-0.122	0.122	
1540	15580	-0.031	-0.121	0.121	-0.122	0.122	
1560	15600	-0.034	-0.124	0.124	-0.125	0.125	
1580	15620	-0.038	-0.128	0.128	-0.129	0.129	
1600	15640	-0.041	-0.131	0.131	-0.132	0.132	
1620	15660	-0.044	-0.134	0.134	-0.135	0.135	
1640	15680	-0.041	-0.131	0.131	-0.132	0.132	
1660	15700	-0.05	-0.14	0.14	-0.141	0.141	
1680	15720	-0.057	-0.147	0.147	-0.148	0.148	
1700	15740	-0.066	-0.156	0.156	-0.157	0.157	
1720	15760	-0.076	-0.166	0.166	-0.167	0.167	
1740	15780	-0.079	-0.169	0.169	-0.17	0.17	
1760	15800	-0.085	-0.175	0.175	-0.176	0.176	
1780	15820	-0.085	-0.175	0.175	-0.176	0.176	
1800	15840	-0.085	-0.175	0.175	-0.176	0.176	
1820	15860	-0.085	-0.175	0.175	-0.176	0.176	
1840	15880	-0.088	-0.178	0.178	-0.179	0.179	
1860	15900	-0.085	-0.175	0.175	-0.176	0.176	
1880	15920	-0.085	-0.175	0.175	-0.176	0.176	
1900	15940	-0.082	-0.172	0.172	-0.173	0.173	
1920	15960	-0.082	-0.172	0.172	-0.173	0.173	
1940	15980	-0.082	-0.172	0.172	-0.173	0.173	
1960	16000	-0.076	-0.166	0.166	-0.167	0.167	
1980	16020	-0.072	-0.162	0.162	-0.163	0.163	
2000	16040	-0.066	-0.156	0.156	-0.157	0.157	
2020	16060	-0.066	-0.156	0.156	-0.157	0.157	
2040	16080	-0.066	-0.156	0.156	-0.157	0.157	
2060	16100	-0.06	-0.15	0.15	-0.151	0.151	
2080	16120	-0.057	-0.147	0.147	-0.148	0.148	
2100	16140	-0.05	-0.14	0.14	-0.141	0.141	
2120	16160	-0.041	-0.131	0.131	-0.132	0.132	
2140	16180	-0.041	-0.131	0.131	-0.132	0.132	
2160	16200	-0.038	-0.128	0.128	-0.129	0.129	
2180	16220	-0.034	-0.124	0.124	-0.125	0.125	
2200	16240	-0.034	-0.124	0.124	-0.125	0.125	
2220	16260	-0.031	-0.121	0.121	-0.122	0.122	
2240	16280	-0.031	-0.121	0.121	-0.122	0.122	
2260	16300	-0.034	-0.124	0.124	-0.125	0.125	

Table B-7
Background Monitoring Well Fluctuations During Pumping Test Activities

Data Logger Time	Elapsed Time (min)	Transducer Reading (ft)	MWBP-09 Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	MWBP-09B Cumulative Xd Reading (ft)	Water Level Fluctuation (ft)	Comments
2280	16320	-0.041	-0.131	0.131	-0.132	0.132	
2300	16340	-0.05	-0.14	0.14	-0.141	0.141	
2320	16360	-0.05	-0.14	0.14	-0.141	0.141	
2340	16380	-0.053	-0.143	0.143	-0.144	0.144	
2360	16400	-0.06	-0.15	0.15	-0.151	0.151	
2380	16420	-0.063	-0.153	0.153	-0.154	0.154	End constant Q test in
2400	16440	-0.066	-0.156	0.156	-0.157	0.157	BP-05B @2340 (16420 min)
2420	16460	-0.063	-0.153	0.153	-0.154	0.154	
2440	16480	-0.066	-0.156	0.156	-0.157	0.157	
2460	16500	-0.066	-0.156	0.156	-0.157	0.157	
2480	16520	-0.069	-0.159	0.159	-0.16	0.16	
2500	16540	-0.066	-0.156	0.156	-0.157	0.157	End recovery monitoring
2520	16560	-0.063	-0.153	0.153	-0.154	0.154	at 01:45
2540	16580	-0.063	-0.153	0.153	-0.154	0.154	
2560	16600	-0.063	-0.153	0.153	-0.154	0.154	
2580	16620	-0.063	-0.153	0.153	-0.154	0.154	
2600	16640	-0.057	-0.147	0.147	-0.148	0.148	
2620	16660	-0.057	-0.147	0.147	-0.148	0.148	
2640	16680	-0.057	-0.147	0.147	-0.148	0.148	
2660	16700	-0.057	-0.147	0.147	-0.148	0.148	
2680	16720	-0.057	-0.147	0.147	-0.148	0.148	
2700	16740	-0.053	-0.143	0.143	-0.144	0.144	
2720	16760	-0.05	-0.14	0.14	-0.141	0.141	
2740	16780	-0.047	-0.137	0.137	-0.138	0.138	
2760	16800	-0.044	-0.134	0.134	-0.135	0.135	
2780	16820	-0.038	-0.128	0.128	-0.129	0.129	
2800	16840	-0.031	-0.121	0.121	-0.122	0.122	
2820	16860	-0.028	-0.118	0.118	-0.119	0.119	
2840	16880	-0.028	-0.118	0.118	-0.119	0.119	
2860	16900	-0.031	-0.121	0.121	-0.122	0.122	
2880	16920	-0.028	-0.118	0.118	-0.119	0.119	3/29, 08:00
2900	16940	-0.025	-0.115	0.115	-0.116	0.116	

Table B-8
Barometric Pressure Observations
(From the National Weather Service at Fresno Air Terminal)

Date/Time	Elapsed Time (min)	Pressure Reading (in. Hg)	Pressure Reading (ft. H_2O)	Absolute Change (ft. H_2O)	Comments
3/17/95, 1400	0	29.695	33.644	0	
	60	29.685	33.633	-0.01133	
	120	29.675	33.622	-0.02266	
	180	29.655	33.599	-0.04532	
	240	29.705	33.656	0.01133	
	300	29.755	33.712	0.06798	
	360	29.775	33.735	0.09064	
	420	29.755	33.712	0.06798	
	480	29.775	33.735	0.09064	
3/17, 2300	540	29.785	33.746	0.10197	
	600	29.805	33.769	0.12463	
3/18, 0100	660	29.825	33.792	0.14729	
	720	29.815	33.780	0.13596	
	780	29.795	33.758	0.1133	
	840	29.795	33.758	0.1133	
	900	29.800	33.763	0.118965	
	960	29.830	33.797	0.152955	
	1020	29.845	33.814	0.16995	
	1080	29.880	33.854	0.209605	
	1140	29.895	33.871	0.2266	
	1200	29.885	33.860	0.21527	
	1260	29.875	33.848	0.20394	
	1320	29.865	33.837	0.19261	
	1380	29.860	33.831	0.186945	
	1440	29.855	33.826	0.18128	
	1500	29.865	33.837	0.19261	
	1560	29.875	33.848	0.20394	
	1620	29.855	33.826	0.18128	
	1680	29.835	33.803	0.15862	
	1740	29.835	33.803	0.15862	
	1800	29.835	33.803	0.15862	
	1860	29.845	33.814	0.16995	
	1920	29.855	33.826	0.18128	
	1980	29.845	33.814	0.16995	
	2040	29.835	33.803	0.15862	
3/19, 0100	2100	29.845	33.814	0.16995	
	2160	29.835	33.803	0.15862	
	2220	29.795	33.758	0.1133	
	2280	29.805	33.769	0.12463	
	2340	29.810	33.775	0.130295	
	2400	29.835	33.803	0.15862	
	2460	29.825	33.792	0.14729	
	2520	29.840	33.809	0.164285	
	2580	29.835	33.803	0.15862	
	2640	29.845	33.814	0.16995	
	2700	29.845	33.814	0.16995	

Table B-8
Barometric Pressure Observations
(From the National Weather Service at Fresno Air Terminal)

Date/Time	Elapsed Time (min)	Pressure Reading (in. Hg)	Pressure Reading (ft. H_2O)	Absolute Change (ft. H_2O)	Comments
	2760	29.825	33.792	0.14729	
	2820	29.805	33.769	0.12463	
	2880	29.765	33.724	0.07931	
	2940	29.745	33.701	0.05665	
	3000	29.725	33.678	0.03399	
	3060	29.715	33.667	0.02266	
	3120	29.715	33.667	0.02266	
	3180	29.715	33.667	0.02266	
	3240	29.715	33.667	0.02266	
	3300	29.645	33.588	-0.05665	
	3360	29.665	33.610	-0.03399	
	3420	29.665	33.610	-0.03399	
	3480	29.660	33.605	-0.039655	
3/20, 0100	3540	29.635	33.576	-0.06798	
	3600	29.615	33.554	-0.09064	
	3660	29.585	33.520	-0.12463	
	3720	29.575	33.508	-0.13596	
	3780	29.555	33.486	-0.15862	
	3840	29.545	33.474	-0.16995	
	3900	29.540	33.469	-0.175615	
	3960	29.560	33.491	-0.152955	
	4020	29.570	33.503	-0.141625	
	4080	29.560	33.491	-0.152955	
	4140	29.550	33.480	-0.164285	
	4200	29.520	33.446	-0.198275	
	4260	29.510	33.435	-0.209605	
	4320	29.480	33.401	-0.243595	
	4380	29.480	33.401	-0.243595	
	4440	29.495	33.418	-0.2266	
	4500	29.480	33.401	-0.243595	
	4560	29.470	33.390	-0.254925	
	4620	29.470	33.390	-0.254925	
	4680	29.460	33.378	-0.266255	
	4740	29.475	33.395	-0.24926	
	4800	29.470	33.390	-0.254925	
	4860	29.470	33.390	-0.254925	
	4920	29.455	33.373	-0.27192	
3/21, 0100	4980	29.470	33.390	-0.254925	
	5040	29.470	33.390	-0.254925	
	5100	29.450	33.367	-0.277585	
	5160	29.450	33.367	-0.277585	
	5220	29.460	33.378	-0.266255	
	5280	29.480	33.401	-0.243595	
	5340	29.490	33.412	-0.232265	
	5400	29.505	33.429	-0.21527	
	5460	29.525	33.452	-0.19261	

Table B-8
Barometric Pressure Observations
(From the National Weather Service at Fresno Air Terminal)

Date/Time	Elapsed Time (min)	Pressure Reading (in. Hg)	Pressure Reading (ft. H_2O)	Absolute Change (ft. H_2O)	Comments
	5520	29.530	33.457	-0.186945	
	5580	29.545	33.474	-0.16995	
3/21, 1200	5640	29.545	33.474	-0.16995	Begin step-drawdown test
	5700	29.530	33.457	-0.186945	in MWBP-12 @1230
	5760	29.525	33.452	-0.19261	
	5820	29.520	33.446	-0.198275	
3/21, 1600	5880	29.510	33.435	-0.209605	End step-drawdown test
	5940	29.530	33.457	-0.186945	in MWBP-12 @1600
	6000	29.550	33.480	-0.164285	
	6060	29.565	33.497	-0.14729	
	6120	29.590	33.525	-0.118965	
	6180	29.620	33.559	-0.084975	
	6240	29.625	33.565	-0.07931	
	6300	29.645	33.588	-0.05665	
	6360	29.665	33.610	-0.03399	
3/22, 0100	6420	29.685	33.633	-0.01133	
	6480	29.675	33.622	-0.02266	
	6540	29.675	33.622	-0.02266	
	6600	29.665	33.610	-0.03399	
	6660	29.655	33.599	-0.04532	
	6720	29.655	33.599	-0.04532	
	6780	29.645	33.588	-0.05665	
	6840	29.655	33.599	-0.04532	
	6900	29.645	33.588	-0.05665	
	6960	29.635	33.576	-0.06798	Begin step-drawdown test
3/22, 1100	7020	29.620	33.559	-0.084975	in MWBP-05B @1050
	7080	29.595	33.531	-0.1133	
	7140	29.570	33.503	-0.141625	
	7200	29.540	33.469	-0.175615	
	7260	29.530	33.457	-0.186945	
3/22, 1600	7320	29.490	33.412	-0.232265	End step-drawdown test
	7380	29.470	33.390	-0.254925	in MWBP-05B @1615
	7440	29.445	33.361	-0.28325	
	7500	29.460	33.378	-0.266255	
	7560	29.450	33.367	-0.277585	
	7620	29.445	33.361	-0.28325	
	7680	29.430	33.344	-0.300245	
	7740	29.425	33.339	-0.30591	
	7800	29.410	33.322	-0.322905	
3/23, 0100	7860	29.390	33.299	-0.345565	
	7920	29.440	33.356	-0.288915	
	7980	29.440	33.356	-0.288915	
	8040	29.420	33.333	-0.311575	
	8100	29.460	33.378	-0.266255	
	8160	29.480	33.401	-0.243595	
	8220	29.520	33.446	-0.198275	

Table B-8
Barometric Pressure Observations
(From the National Weather Service at Fresno Air Terminal)

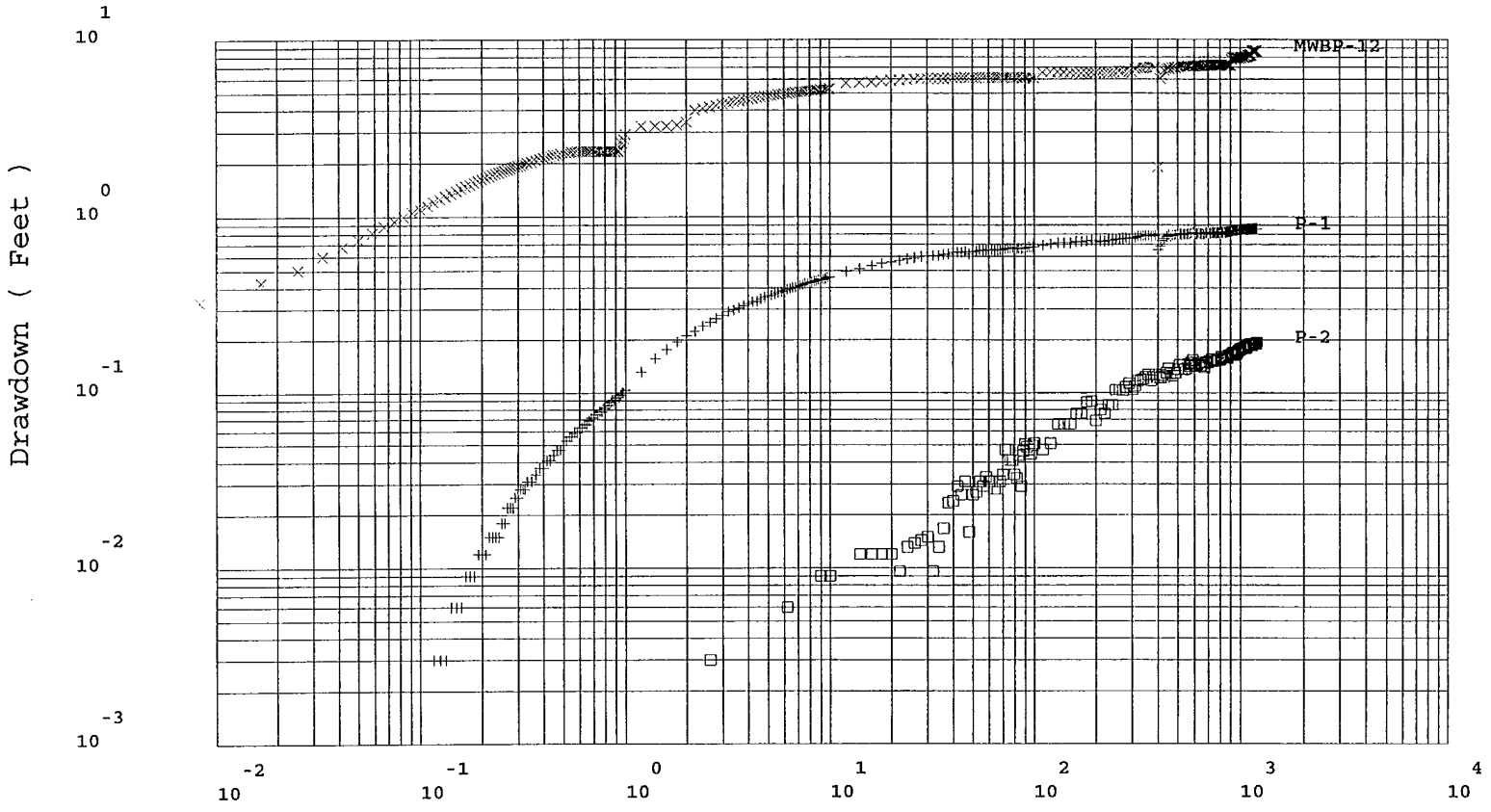
Date/Time	Elapsed Time (min)	Pressure Reading (in. Hg)	Pressure Reading (ft. H_2O)	Absolute Change (ft. H_2O)	Comments
	8280	29.530	33.457	-0.186945	
	8340	29.530	33.457	-0.186945	
3/23, 1000	8400	29.550	33.480	-0.164285	Begin constant rate test
	8460	29.555	33.486	-0.15862	in MWBP-12 @1000
	8520	29.550	33.480	-0.164285	
	8580	29.560	33.491	-0.152955	
	8640	29.550	33.480	-0.164285	
	8700	29.550	33.480	-0.164285	
	8760	29.550	33.480	-0.164285	
	8820	29.570	33.503	-0.141625	
	8880	29.580	33.514	-0.130295	
	8940	29.600	33.537	-0.107635	
	9000	29.665	33.610	-0.03399	
	9060	29.655	33.599	-0.04532	
	9120	29.675	33.622	-0.02266	
	9180	29.690	33.639	-0.005665	
	9240	29.695	33.644	0	
3/24 0100	9300	29.705	33.656	0.01133	
	9360	29.705	33.656	0.01133	
	9420	29.705	33.656	0.01133	
	9480	29.705	33.656	0.01133	
	9540	29.725	33.678	0.03399	
3/24 0600	9600	29.735	33.690	0.04532	End constant rate test
	9660	29.745	33.701	0.05665	in MWBP-12 @0600
	9720	29.765	33.724	0.07931	
	9780	29.775	33.735	0.09064	
	9840	29.785	33.746	0.10197	
	9900	29.780	33.741	0.096305	
	9960	29.770	33.729	0.084975	
	10020	29.745	33.701	0.05665	
	10080	29.725	33.678	0.03399	
	10140	29.715	33.667	0.02266	
	10200	29.705	33.656	0.01133	
	10260	29.695	33.644	0	
	10320	29.715	33.667	0.02266	
	10380	29.720	33.673	0.028325	
	10440	29.745	33.701	0.05665	
	10500	29.755	33.712	0.06798	
	10560	29.765	33.724	0.07931	
	10620	29.760	33.718	0.073645	
	10680	29.755	33.712	0.06798	
3/25 0100	10740	29.755	33.712	0.06798	
	10800	29.755	33.712	0.06798	
	10860	29.755	33.712	0.06798	
	10920	29.755	33.712	0.06798	
	10980	29.775	33.735	0.09064	

Table B-8
Barometric Pressure Observations
(From the National Weather Service at Fresno Air Terminal)

Date/Time	Elapsed Time (min)	Pressure Reading (in. Hg)	Pressure Reading (ft. H_2O)	Absolute Change (ft. H_2O)	Comments
	11040	29.785	33.746	0.10197	
	11100	29.805	33.769	0.12463	
	11160	29.820	33.786	0.141625	
	11220	29.830	33.797	0.152955	
	11280	29.825	33.792	0.14729	
	11340	29.820	33.786	0.141625	
	11400	29.815	33.780	0.13596	
	11460	29.805	33.769	0.12463	
	11520	29.795	33.758	0.1133	
	11580	29.790	33.752	0.107635	
	11640	29.785	33.746	0.10197	
	11700	29.785	33.746	0.10197	
	11760	29.795	33.758	0.1133	
	11820	29.805	33.769	0.12463	
	11880	29.815	33.780	0.13596	
	11940	29.820	33.786	0.141625	
	12000	29.815	33.780	0.13596	
	12060	29.815	33.780	0.13596	
	12120	29.825	33.792	0.14729	
3/26, 0100	12180	29.825	33.792	0.14729	
	12240	29.835	33.803	0.15862	
	12300	29.835	33.803	0.15862	
	12360	29.845	33.814	0.16995	
	12420	29.855	33.826	0.18128	
	12480	29.865	33.837	0.19261	
	12540	29.875	33.848	0.20394	
	12600	29.885	33.860	0.21527	
	12660	29.895	33.871	0.2266	
	12720	29.895	33.871	0.2266	
	12780	29.895	33.871	0.2266	
	12840	29.880	33.854	0.209605	
	12900	29.855	33.826	0.18128	
	12960	29.840	33.809	0.164285	
	13020	29.825	33.792	0.14729	
	13080	29.805	33.769	0.12463	
	13140	29.800	33.763	0.118965	
	13200	29.805	33.769	0.12463	
	13260	29.815	33.780	0.13596	
	13320	29.825	33.792	0.14729	
	13380	29.830	33.797	0.152955	
	13440	29.835	33.803	0.15862	
	13500	29.835	33.803	0.15862	
	13560	29.835	33.803	0.15862	
3/27, 0100	13620	29.835	33.803	0.15862	
	13680	29.825	33.792	0.14729	
	13740	29.825	33.792	0.14729	

Table B-8
Barometric Pressure Observations
(From the National Weather Service at Fresno Air Terminal)

Date/Time	Elapsed Time (min)	Pressure Reading (in. Hg)	Pressure Reading (ft. H_2O)	Absolute Change (ft. H_2O)	Comments
	13800	29.815	33.780	0.13596	
	13860	29.815	33.780	0.13596	
	13920	29.815	33.780	0.13596	
	13980	29.825	33.792	0.14729	
	14040	29.835	33.803	0.15862	
	14100	29.835	33.803	0.15862	
	14160	29.835	33.803	0.15862	
	14220	29.815	33.780	0.13596	Begin constant rate test
3/27, 1200	14280	29.800	33.763	0.118965	in MWBP-05B @1140
	14340	29.775	33.735	0.09064	
	14400	29.755	33.712	0.06798	
	14460	29.735	33.690	0.04532	
	14520	29.725	33.678	0.03399	
	14580	29.720	33.673	0.028325	
	14640	29.725	33.678	0.03399	
	14700	29.725	33.678	0.03399	
	14760	29.735	33.690	0.04532	
	14820	29.735	33.690	0.04532	
	14880	29.725	33.678	0.03399	
	14940	29.725	33.678	0.03399	
	15000	29.735	33.690	0.04532	
3/28, 0100	15060	29.735	33.690	0.04532	
	15120	29.735	33.690	0.04532	
	15180	29.725	33.678	0.03399	
	15240	29.715	33.667	0.02266	
	15300	29.715	33.667	0.02266	
	15360	29.725	33.678	0.03399	
	15420	29.725	33.678	0.03399	
	15480	29.725	33.678	0.03399	
	15540	29.730	33.684	0.039655	
	15600	29.730	33.684	0.039655	
	15660	29.725	33.678	0.03399	
	15720	29.715	33.667	0.02266	
	15780	29.680	33.627	-0.016995	
	15840	29.665	33.610	-0.03399	
	15900	29.655	33.599	-0.04532	
	15960	29.645	33.588	-0.05665	
	16020	29.645	33.588	-0.05665	
	16080	29.645	33.588	-0.05665	
	16140	29.655	33.599	-0.04532	
	16200	29.665	33.610	-0.03399	
	16260	29.675	33.622	-0.02266	
	16320	29.675	33.622	-0.02266	
	16380	29.665	33.610	-0.03399	End constant rate test
3/29, 0000	16440	29.655	33.599	-0.04532	in MWBP-05B @2340



FILE: c:\pmptst\BP12Q24.PTF

CONSTANT RATE PUMPING TEST RESULTS AT MWBP-12
FRESNO ANG, MARCH 1995

Q = 7.5 GPM

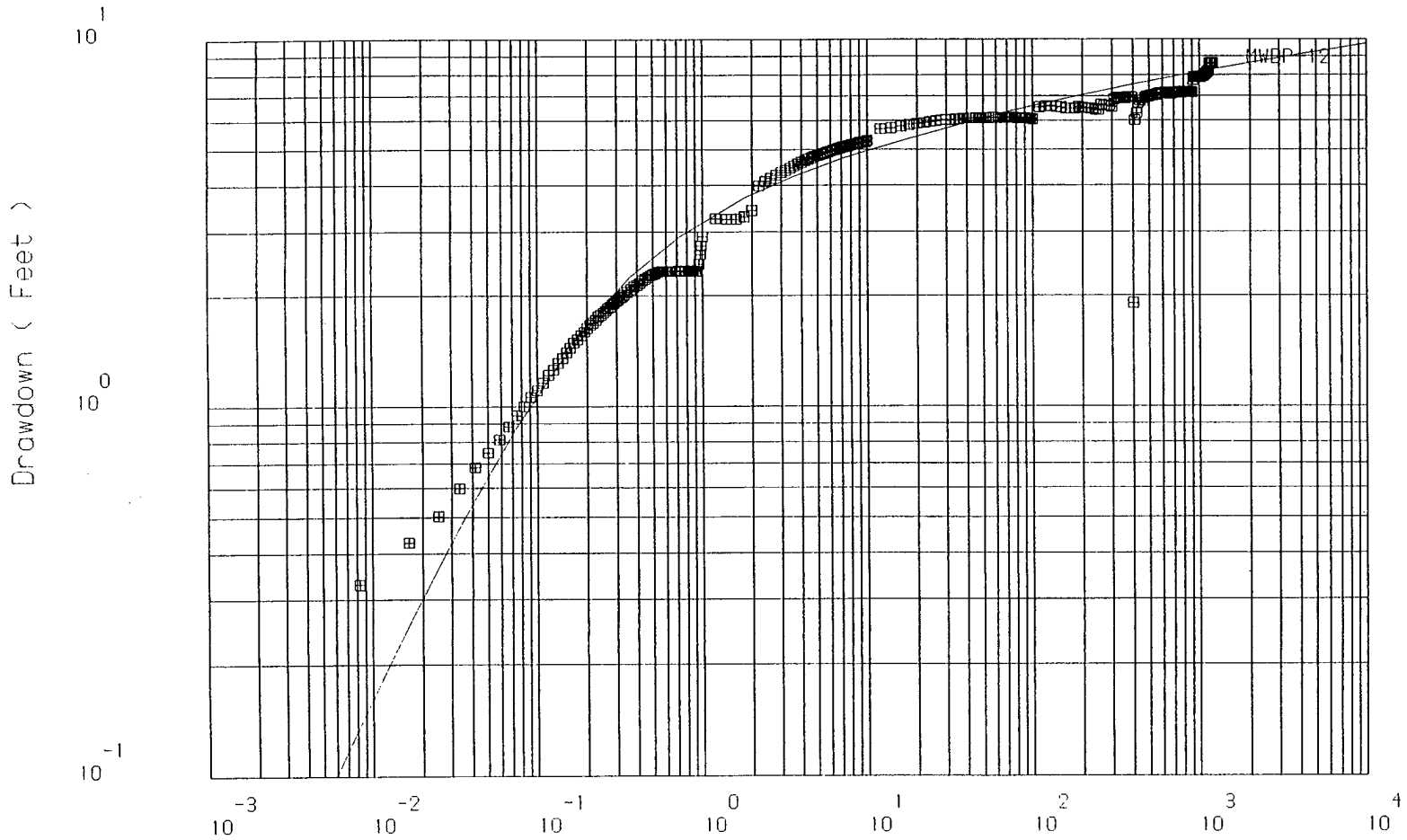
Figure :

[PUMPING TEST LOG-LOG ANALYSIS : Papadopulos & Cooper TYPE CURVE 0.1]

Pumping well : MWBP-12
Pumping rate Q = 7.5000 USG/Min
Radius of casing rc = 0.5000 FT
Radius of well bore rw = 0.1600 FT
Alfa = 0.10000

Transmissivity T = 1258.394 USGPD/FT
Storativity S = 0.06594348
Stor. [Alfa*rc^2/rw^2] S2 = 0.97656250
MATCH POINT :

1/uw	=	276.80	1.00
F(uw,Alfa)	=	1.4641000	1.00
Time	=	1.00	0.0036127 Min
Drawdown	=	1.00	0.6830135 FT

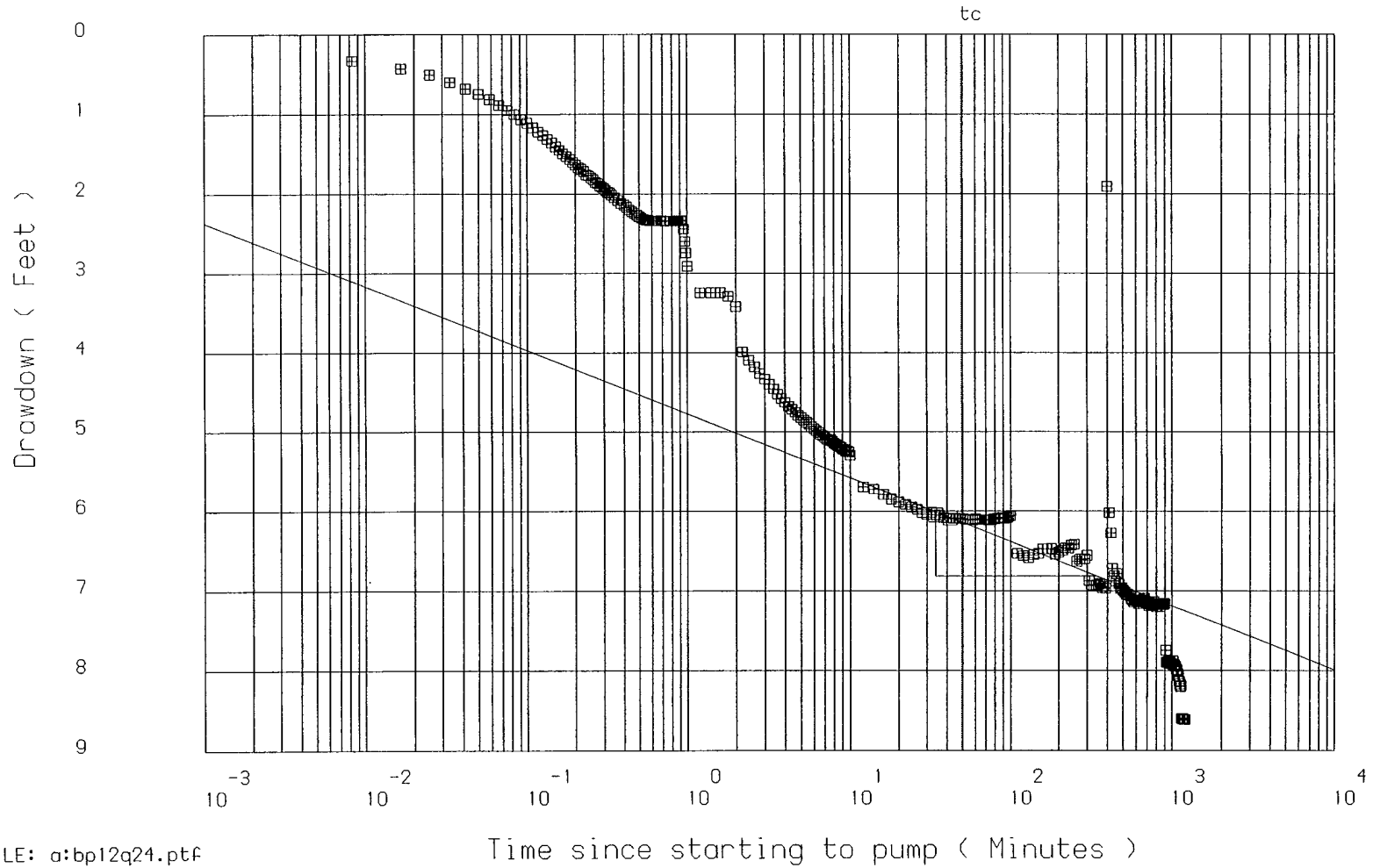


FILE: a:bp12q24.PTF

[PUMPING TEST SEMI-LOG ANALYSIS : JACOB METHOD]

Pumping well : MWBP-12
Pumping rate Q = 7.5000 USG/Min

t0	=	0.00000115 Min
ds	=	0.80418110 FT
T	=	2458.038 USGPD/FT
rc	=	0.5000 FT
rp	=	0.1600 FT
tc	=	49.298 Min



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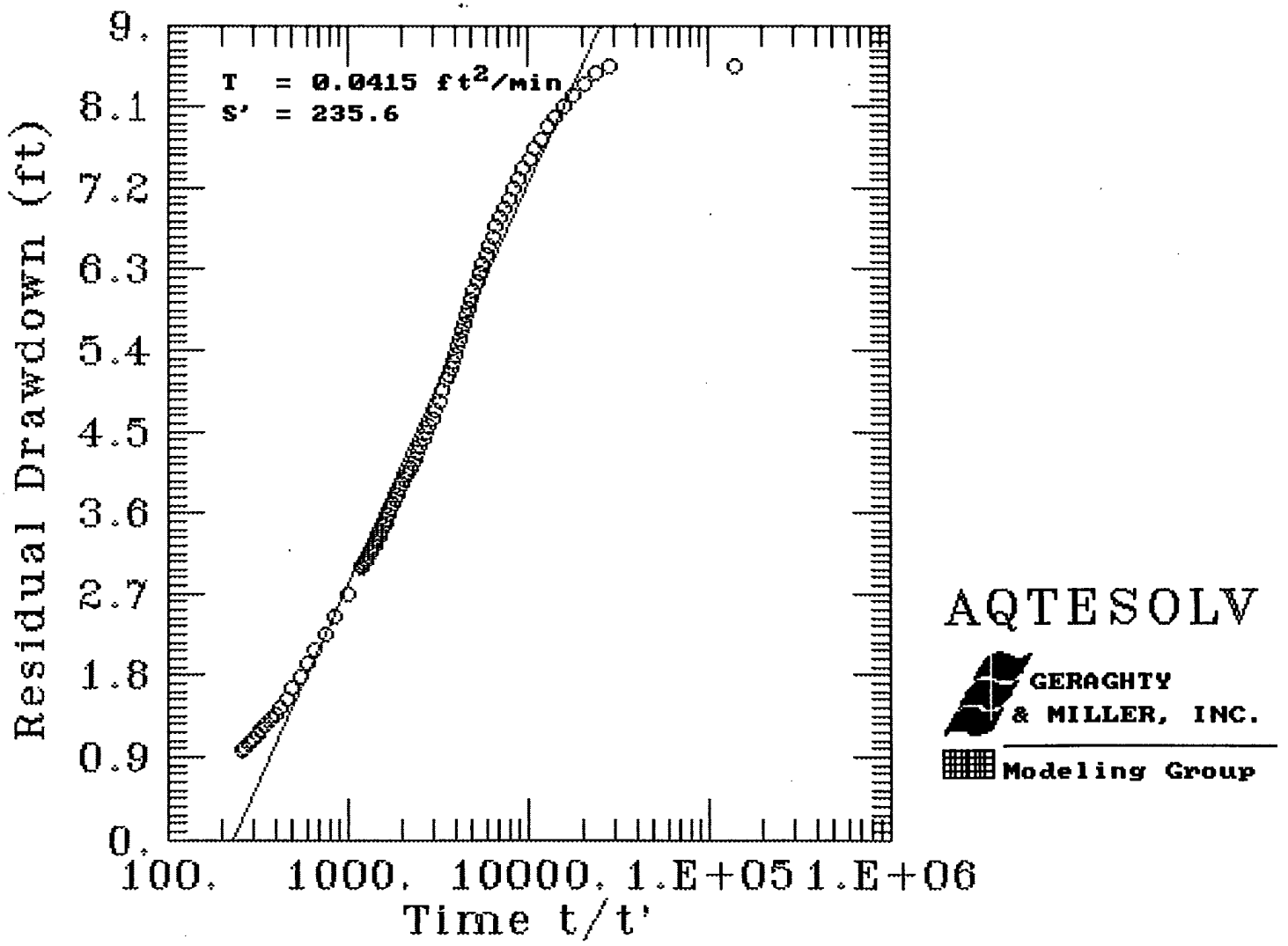
FRESNO ANG MWBP-12 RECOVERY TEST



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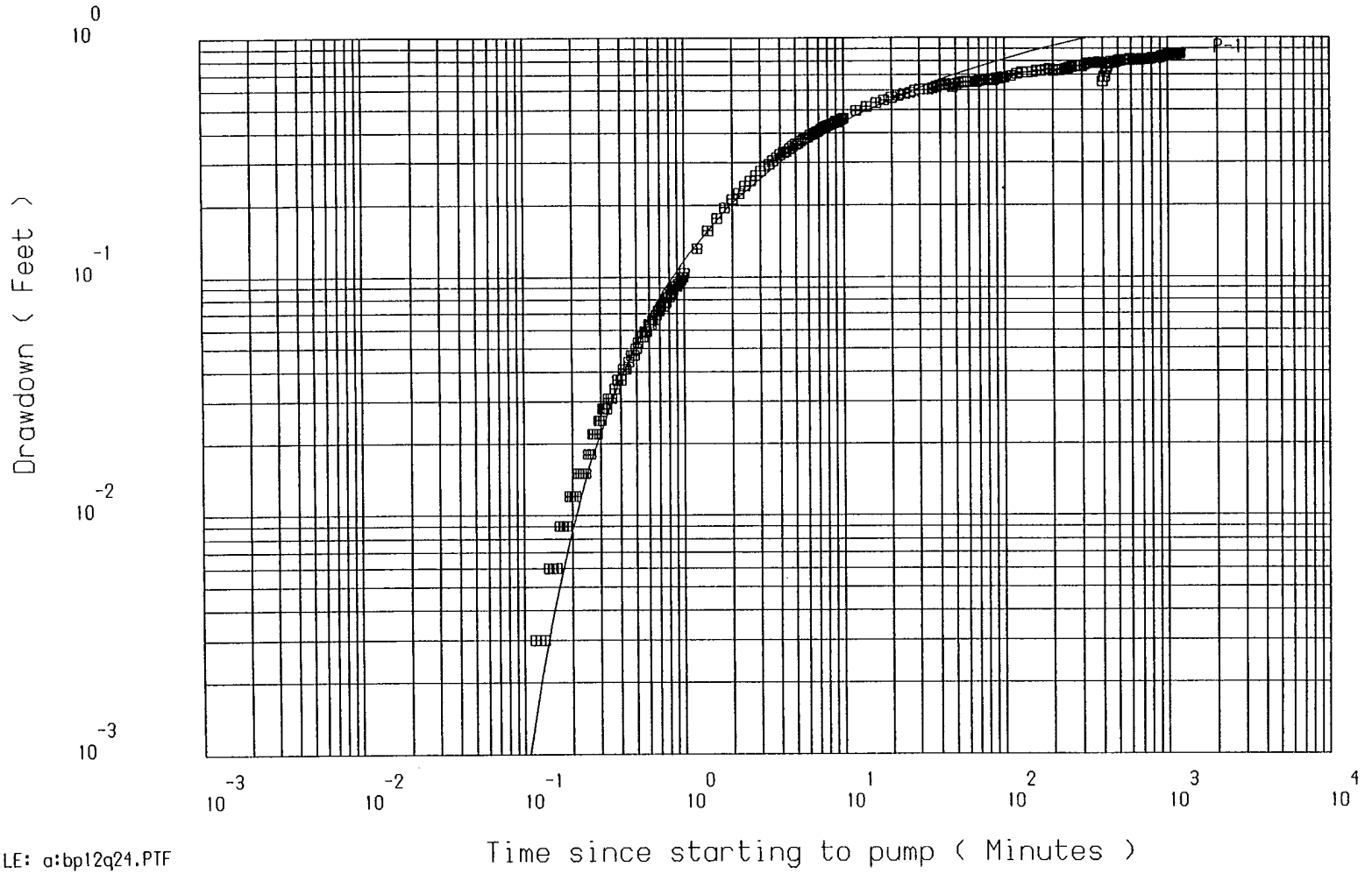
[PUMPING TEST LOG-LOG ANALYSIS : Rtheis TYPE CURVE Confined]

Observation well : P-1
Distance r = 15.00 FT
Pumping well : MWBP-12
Pumping rate Q = 7.5000 USG/Min
Aquifer thickness b = 8.0000 FT

Transmissivity T = 5256.624 USGPD/FT
Storativity S = 0.00334473
Hydr. conductivity K = 657.078 USGPD/FT^2
MATCH POINT :
1/u = 2.5937425 1.00
W(u) = 6.1159090 1.00
Time = 1.00 0.3855433 Min
Drawdown = 1.00 0.1635080 FT



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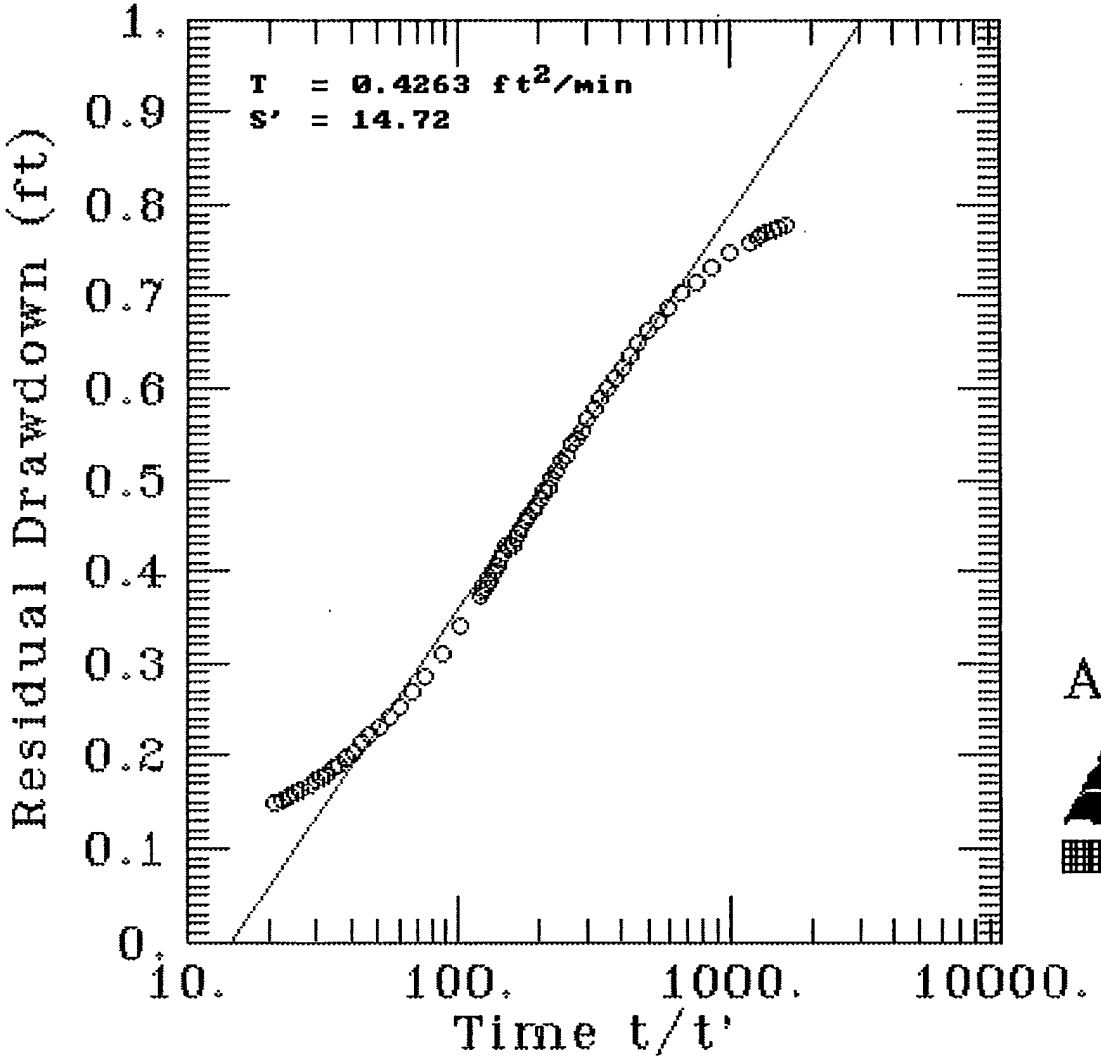
FRESNO ANG P-1 RECOVERY TEST



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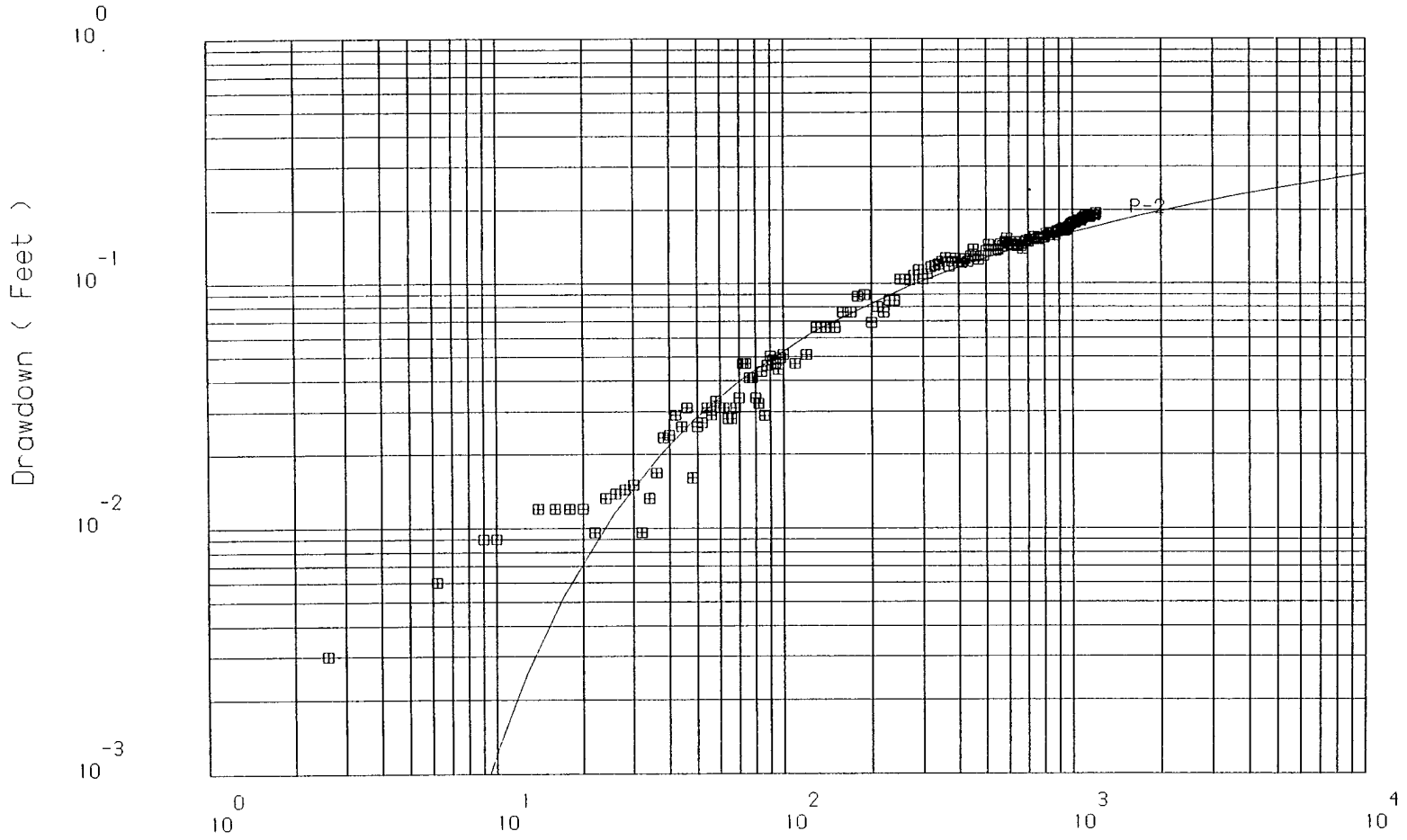
[PUMPING TEST LOG-LOG ANALYSIS : Rtheis TYPE CURVE Confined]

Observation well : P-2
Distance r = 50.00 FT
Pumping well : MWBP-12
Pumping rate Q = 7.5000 USG/Min
Aquifer thickness b = 8.0000 FT

Transmissivity T = 16497.537 USGPD/FT
Storativity S = 0.06260284
Hydr. conductivity K = 2062.192 USGPD/FT^2
MATCH POINT :

1/u	=	0.0391425	1.00
W(u)	=	19.19	1.00
Time	=	1.00	25.55 Min
Drawdown	=	1.00	0.0520987 FT



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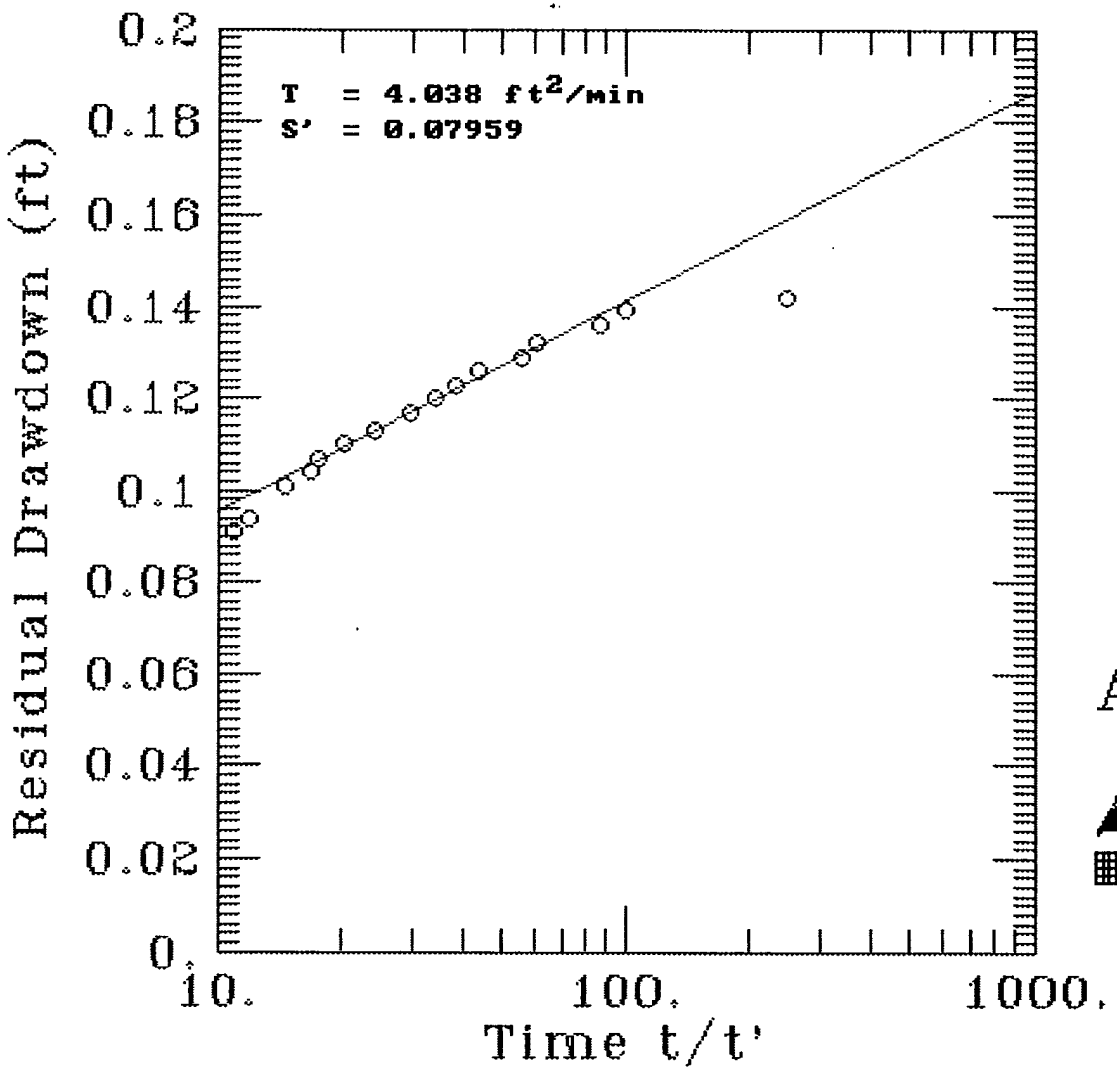
FRESNO ANG P-2 RECOVERY TEST



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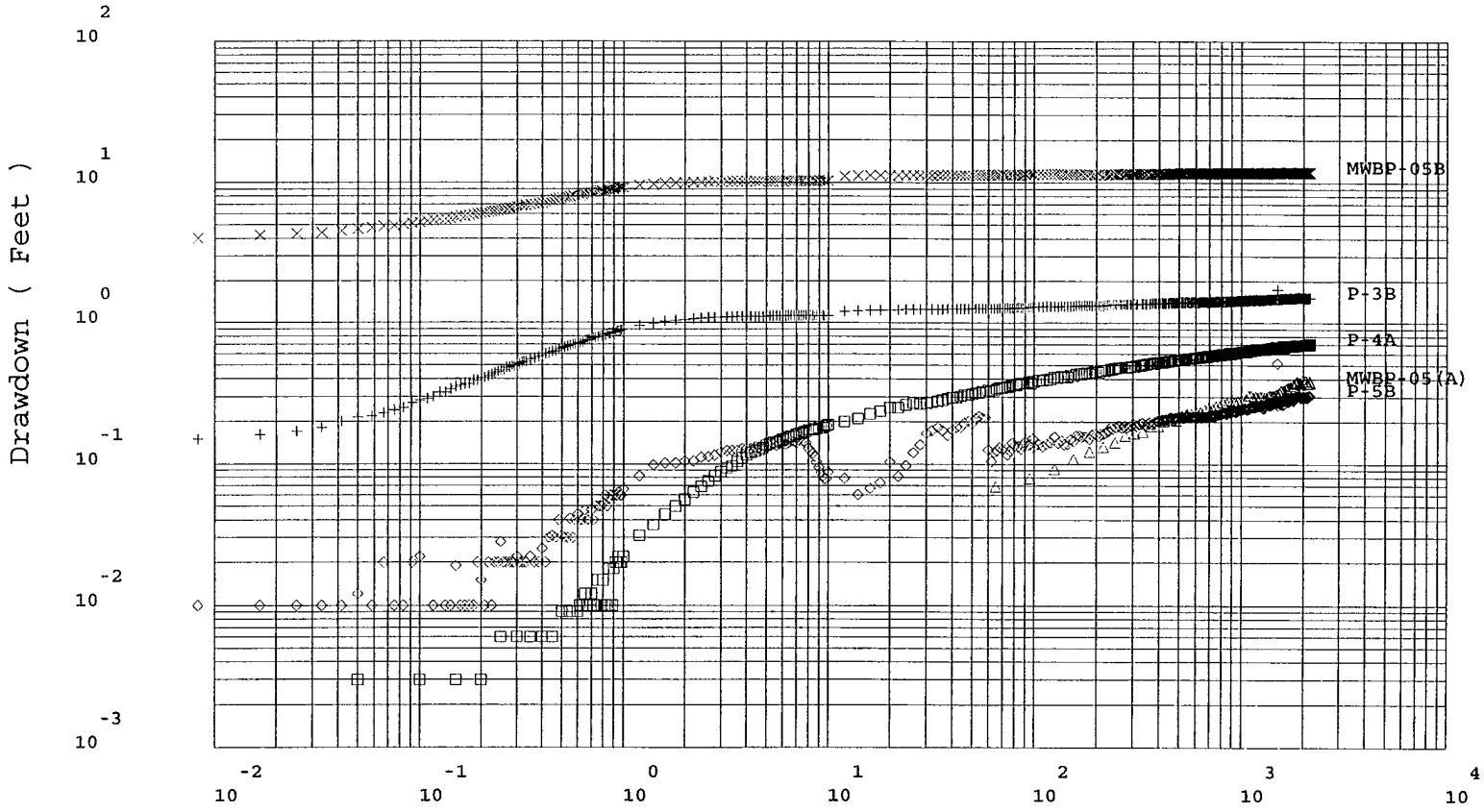


FILE: c:\pmptst\BP5BQ36.PTF

CONSTANT RATE PUMPING TEST RESULTS AT MWBP-05B FRESNO ANG, MARCH 1995	Q = 16 GPM

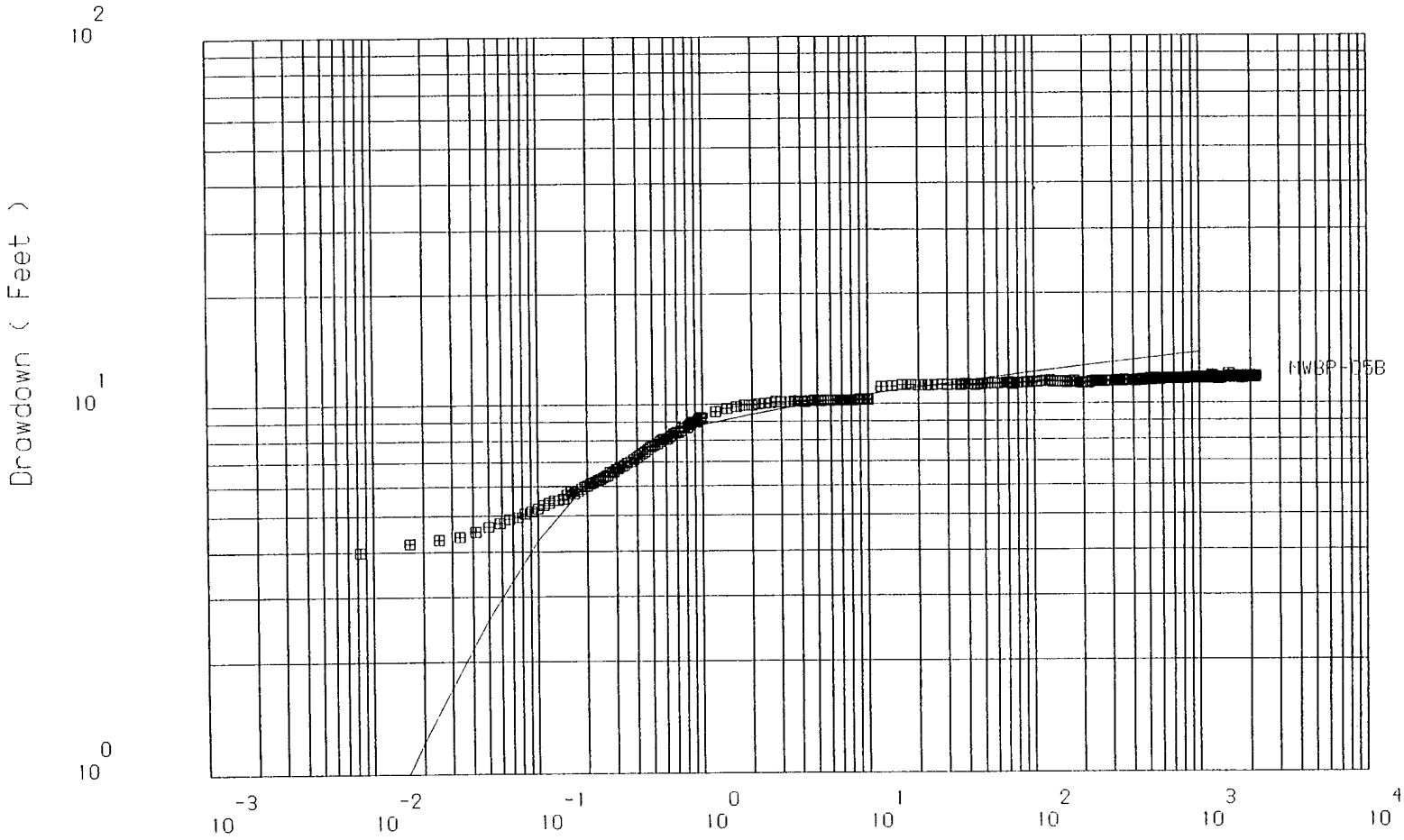
Figure :

[PUMPING TEST LOG-LOG ANALYSIS : Papadopulos & Cooper TYPE CURVE 0.0001]

Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min
Radius of casing rc = 0.1600 FT
Radius of well bore rw = 0.5000 FT
Alfa = 0.00010

Transmissivity T = 2684.574 USGPD/FT
Storativity S = 0.00000397
Stor. [Alfa*rc^2/rw^2] S2 = 0.00001024
MATCH POINT :

1/uw	=	1.004e+06	1.00
F(uw,Alfa)	=	1.4641000	1.00
Time	=	1.00	0.0000010 Min
Drawdown	=	1.00	0.6830135 FT

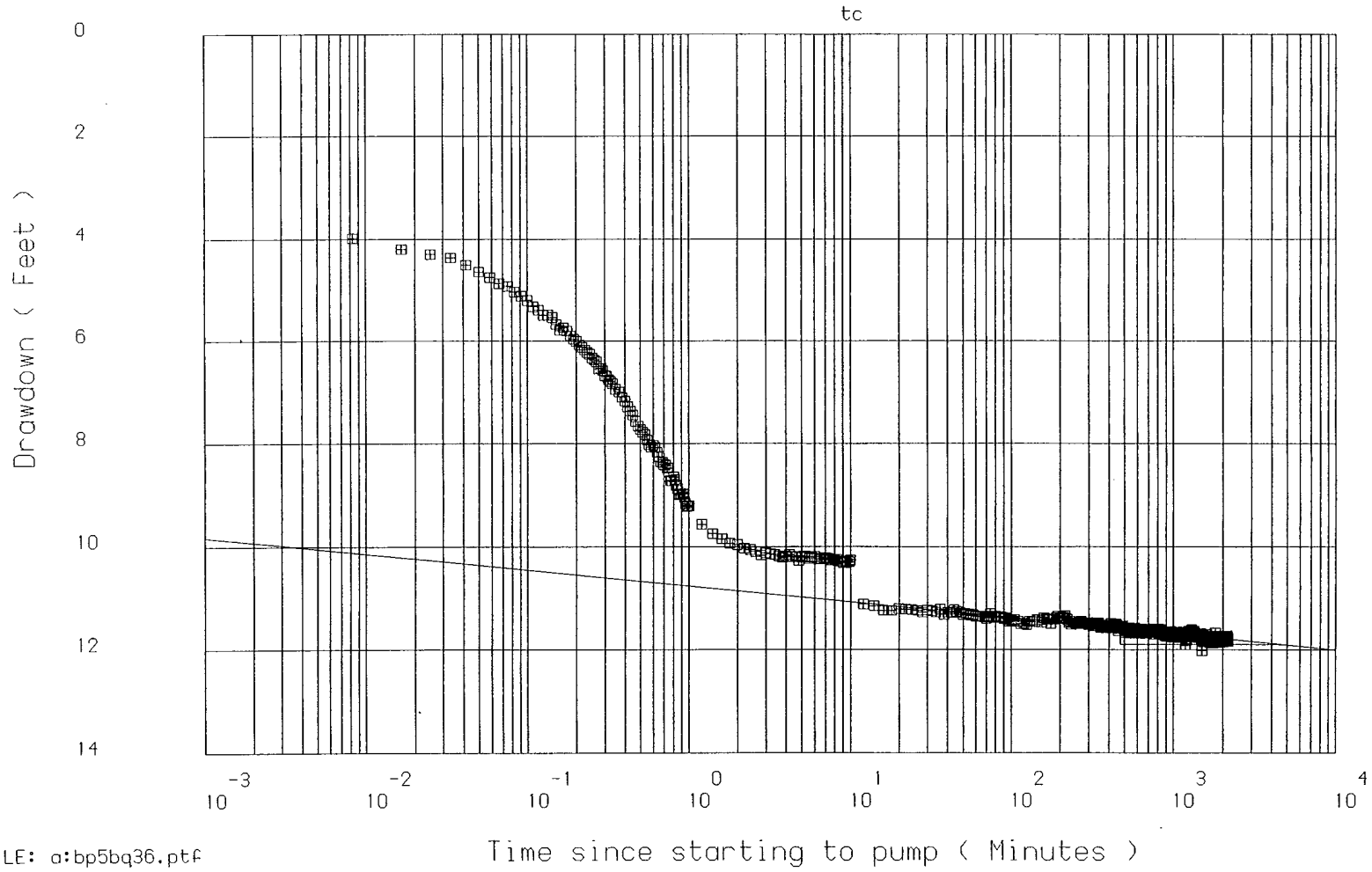


FILE: a:bp5bq36.PTF

[PUMPING TEST SEMI-LOG ANALYSIS : JACOB METHOD]

Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min

t0	=	2.74189148e-35 Min
ds	=	0.31136824 FT
T	=	13543.372 USGPD/FT
rc	=	0.5000 FT
rp	=	0.1600 FT
tc	=	8.94725469 Min



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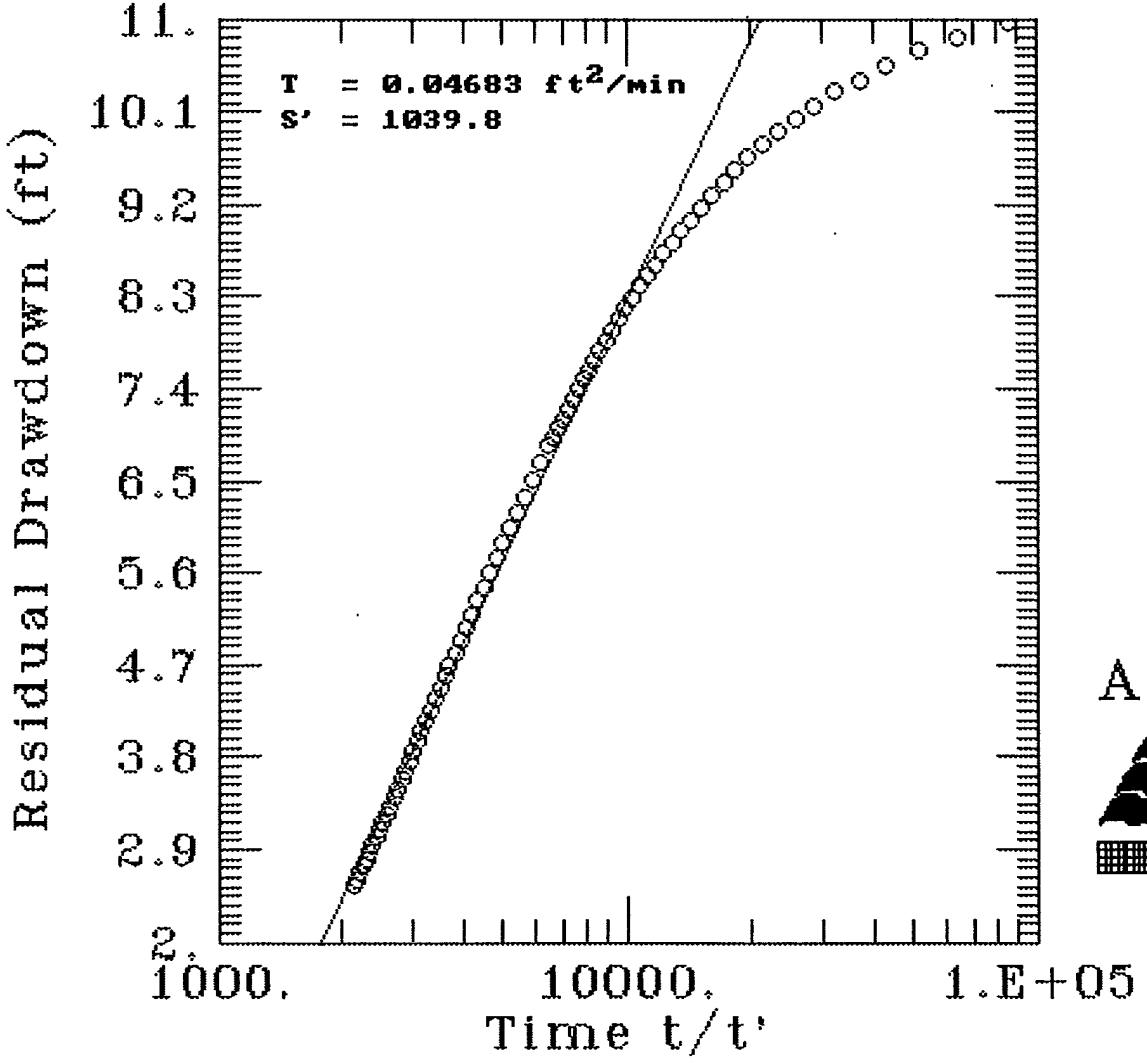
MWBP5B RECOVERY TEST



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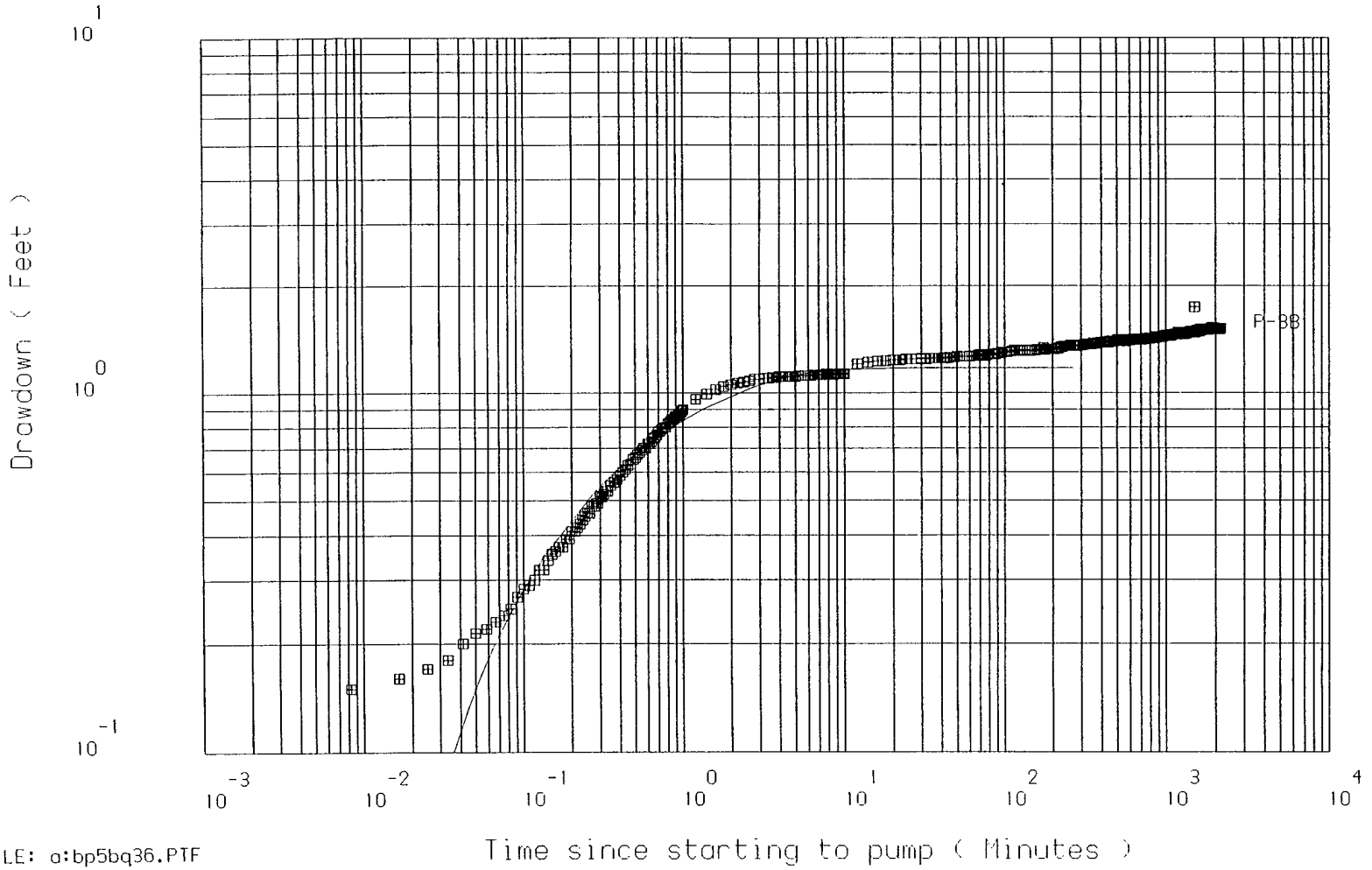
[PUMPING TEST LOG-LOG ANALYSIS : Jacob & Hantush TYPE CURVE 0.15]

Observation well : P-3B
Distance r = 20.00 FT
Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min
Leaky bed thickness b' = 8.0000 FT
r/B = 0.15000

Transmissivity T = 6330.084 USGPD/FT
Storativity S = 0.00015711
Vert. conductivity K' = 2.84853802 USGPD/FT^2
MATCH POINT :

1/u =	37.40	1.00
W(u,r/B) =	3.4522712	1.00
Time =	1.00	0.0267349 Min
Drawdown =	1.00	0.2896644 FT



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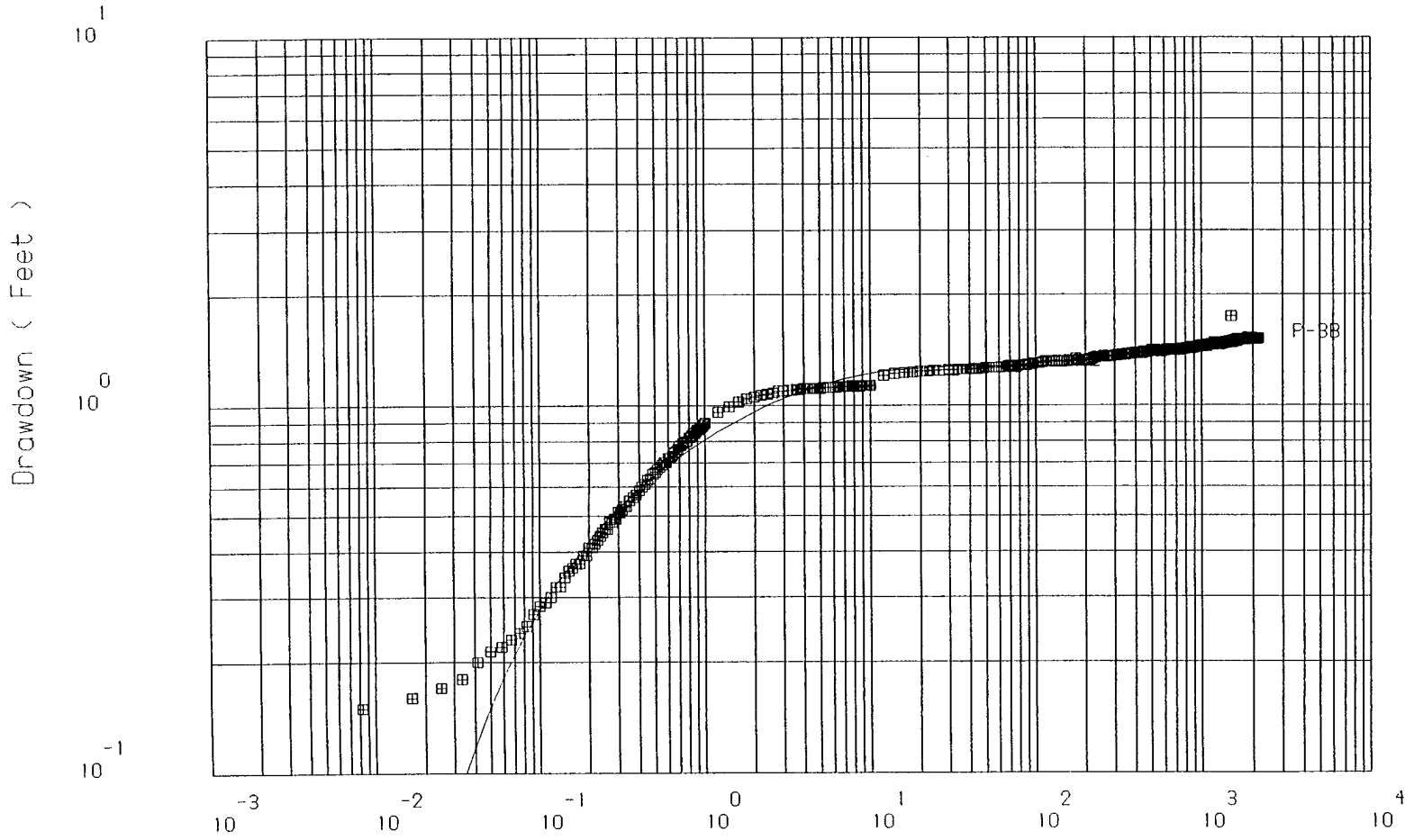
[PUMPING TEST LOG-LOG ANALYSIS : Walton TYPE CURVE 0.1]

Observation well : P-3B
Distance r = 20.00 FT
Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min
Leaky bed thickness b' = 8.0000 FT
r/B = 0.10000

Transmissivity T = 6963.093 USGPD/FT
Storativity S = 0.00015711
Vert. conductivity K' = 1.39261859 USGPD/FT^2
MATCH POINT :

1/u =	41.14	1.00
W(u,r/B) =	3.7974983	1.00
Time =	1.00	0.0243044 Min
Drawdown =	1.00	0.2633313 FT



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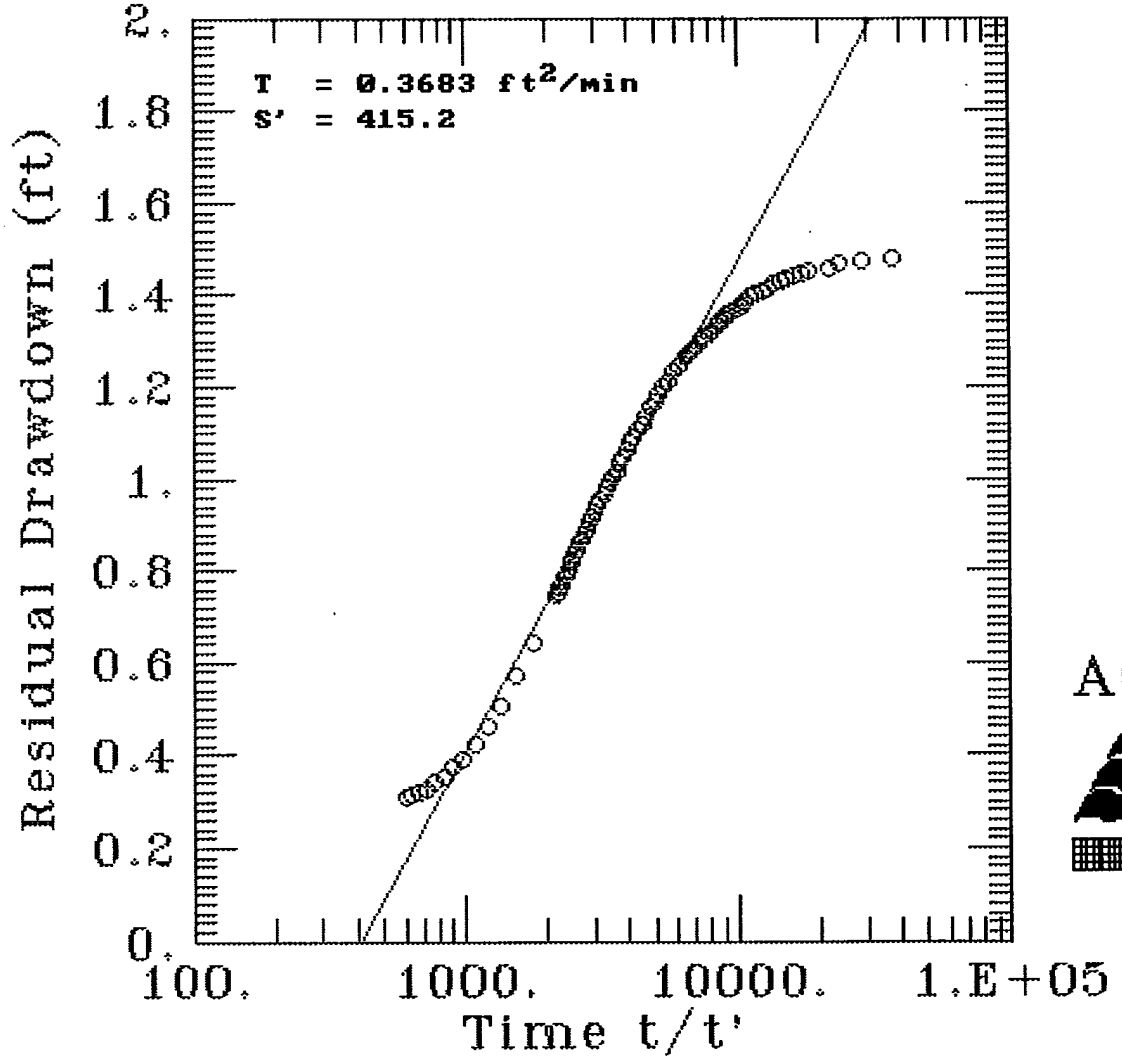
FRESNO ANG P-3B RECOVERY TEST



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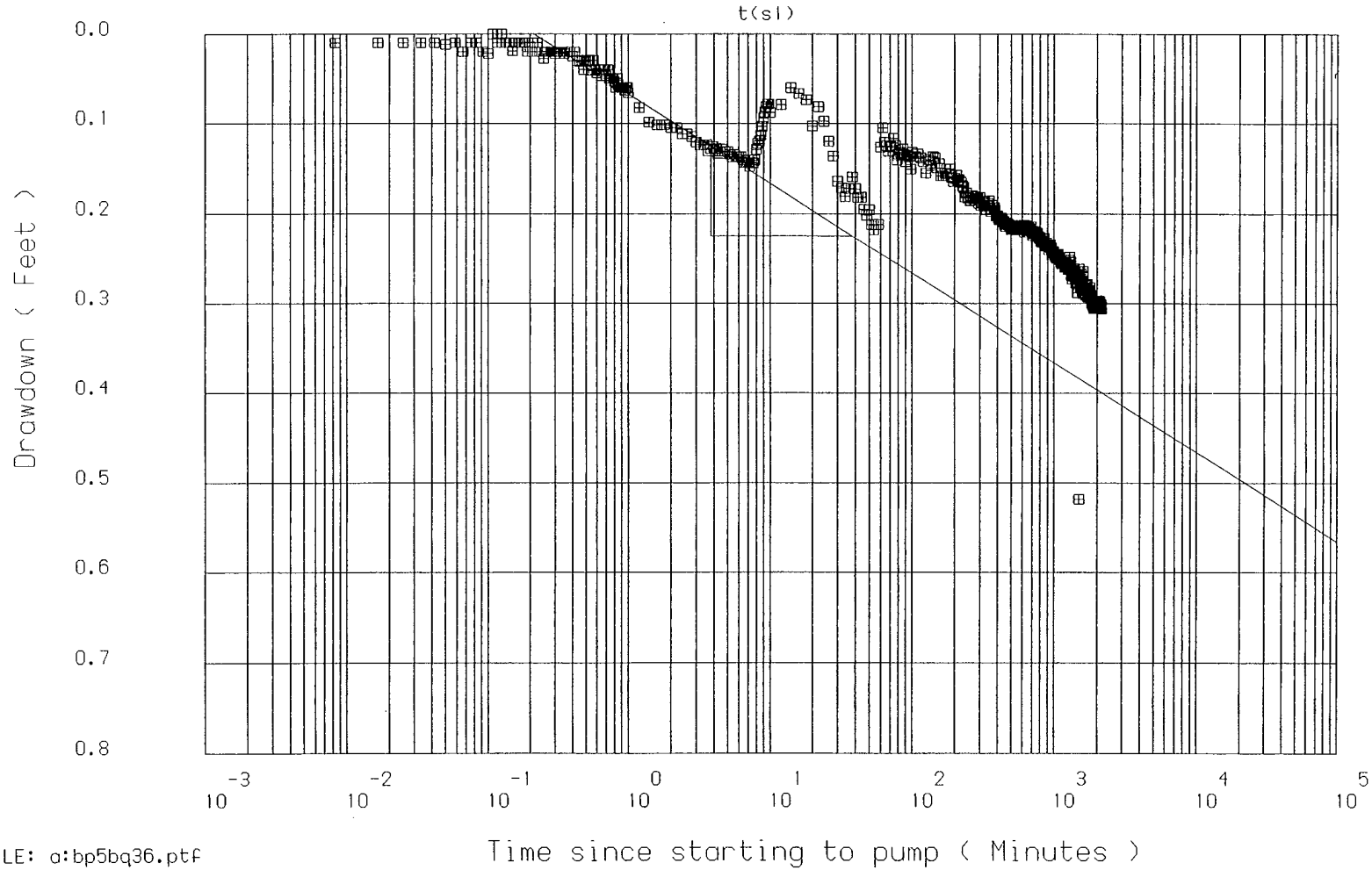
[PUMPING TEST SEMI-LOG ANALYSIS : JACOB METHOD]

Observation well : P-5B
Distance r = 99.00 FT
Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min

t0 = 0.21328578 Min
ds = 0.09973444 FT
T = 42282.044 USGPD/FT
S = 0.0001916930
t(s1) = 5.99866267 Min



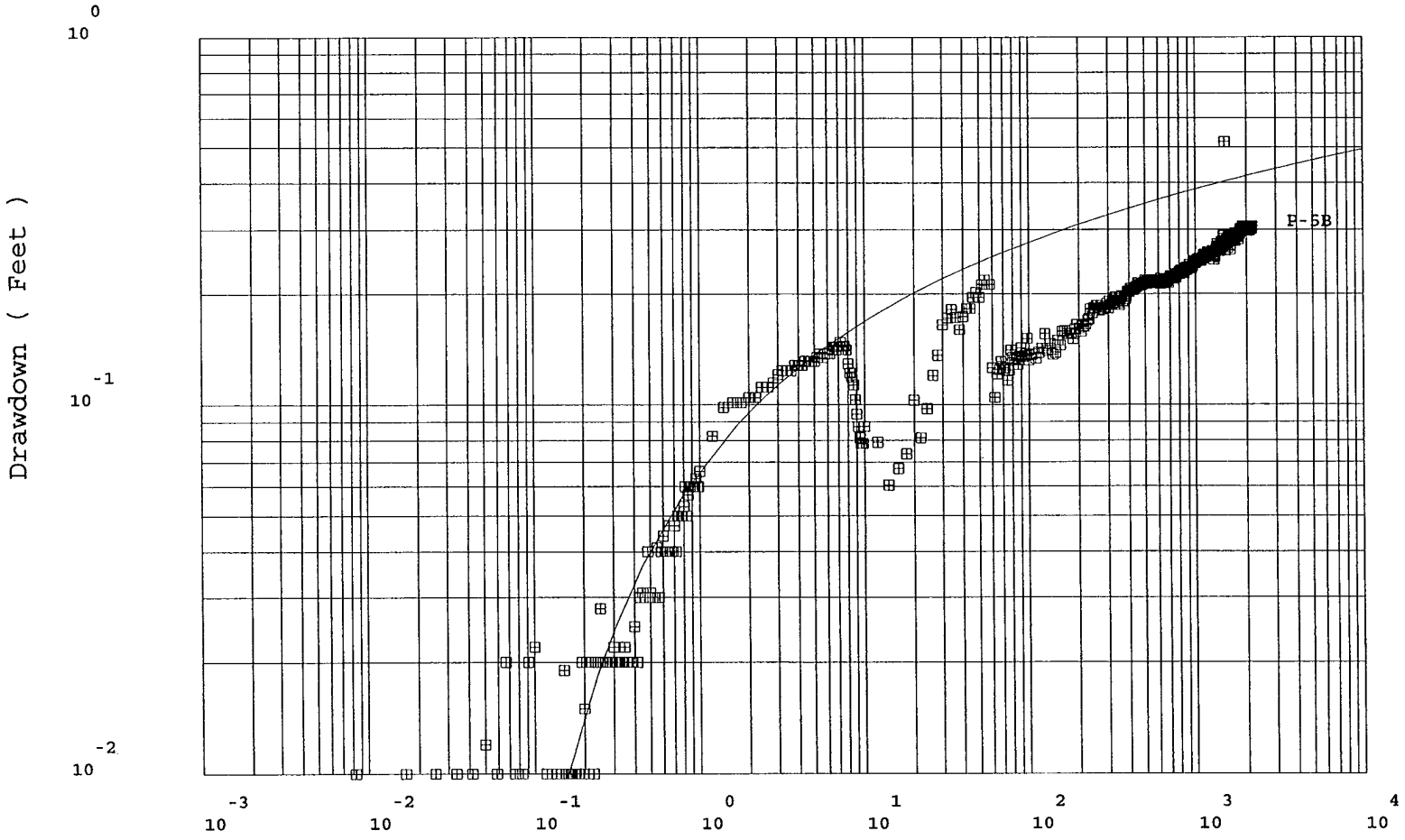
FILE: a:bp5bq36.ptf

[PUMPING TEST LOG-LOG ANALYSIS : Rtheis TYPE CURVE Confined]

Observation well : P-5B
Distance r = 99.00 FT
Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min
Aquifer thickness b = 45.0 FT

Transmissivity T = 38714.221 USGPD/FT
Storativity S = 0.00023886
Hydr. conductivity K = 860.316 USGPD/FT^2
MATCH POINT :

1/u	=	6.1408544	1.00
W(u)	=	21.11	1.00
Time	=	1.00	0.1628438 Min
Drawdown	=	1.00	0.0473624 FT



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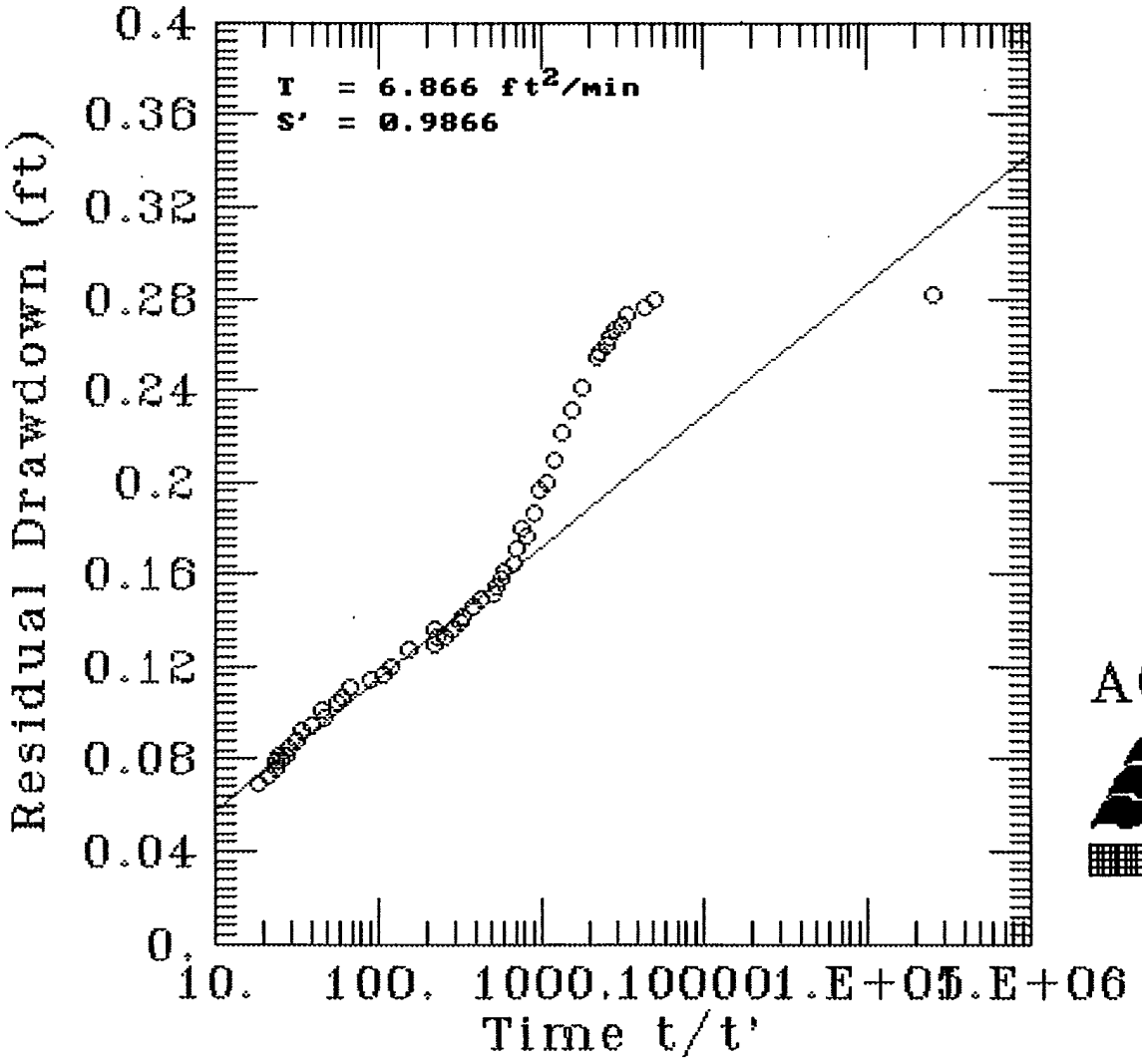
FRESNO ANG P-5B RECOVERY TEST



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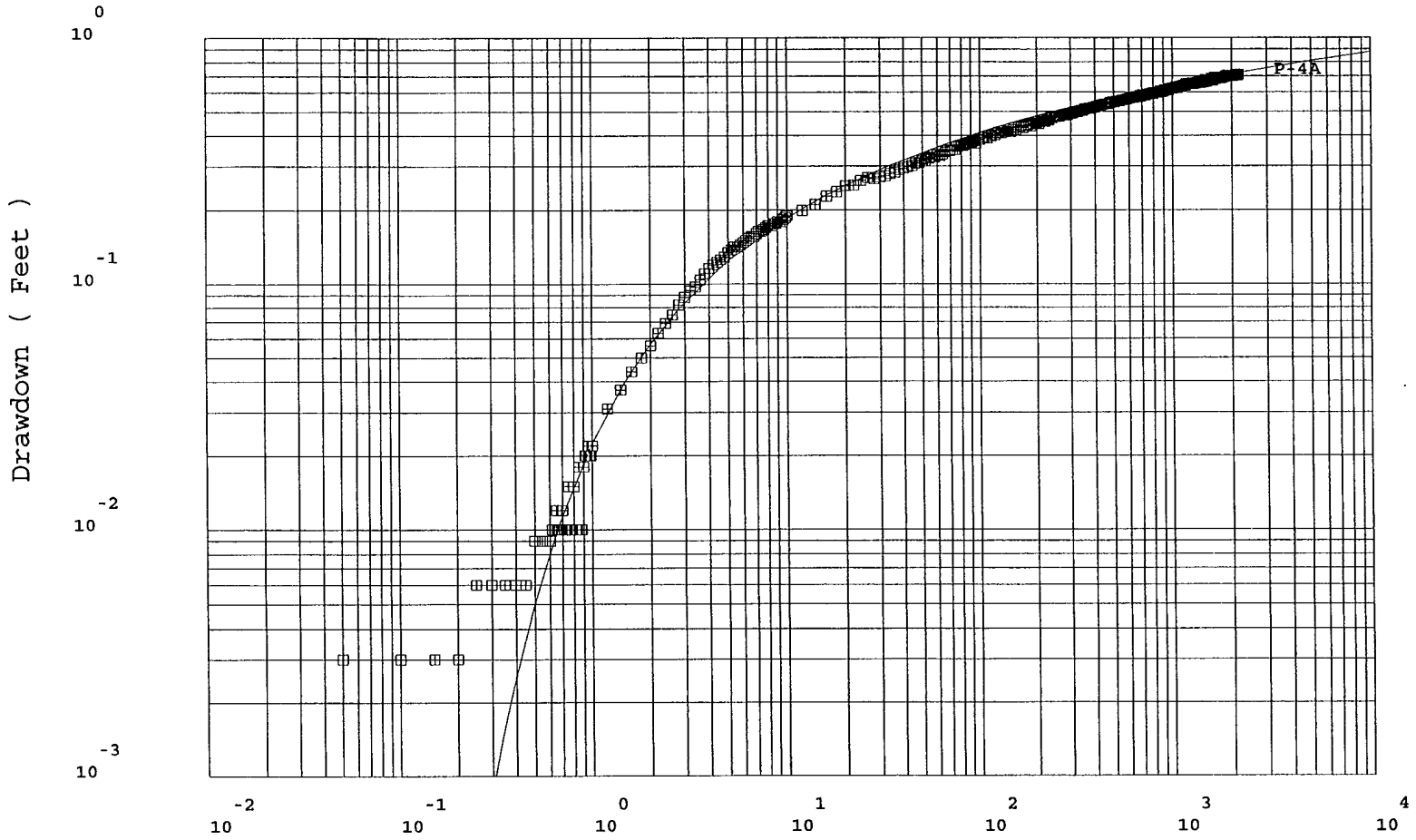
[PUMPING TEST LOG-LOG ANALYSIS : Rtheis TYPE CURVE Confined]

Observation well : P-4A
Distance r = 40.00 FT
Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min
Aquifer thickness b = 45.0 FT

Transmissivity T = 18054.726 USGPD/FT
Storativity S = 0.00417063
Hydr. conductivity K = 401.216 USGPD/FT^2
MATCH POINT :

1/u	=	1.0046913	1.00
W(u)	=	9.8466004	1.00
Time	=	1.00	0.9953306 Min
Drawdown	=	1.00	0.1015579 FT



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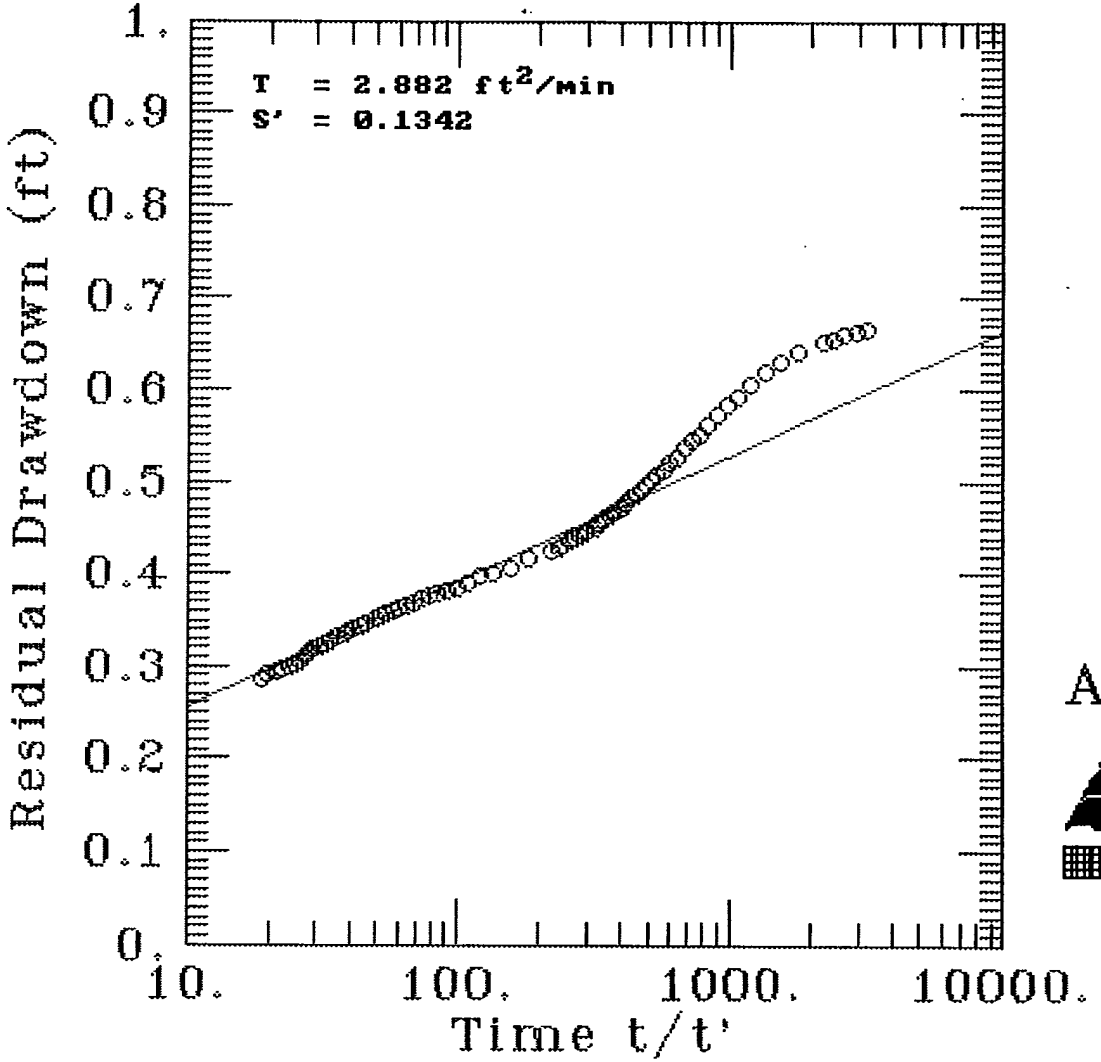
FRESNO ANG P-4A RECOVERY TEST



AQTESOLV

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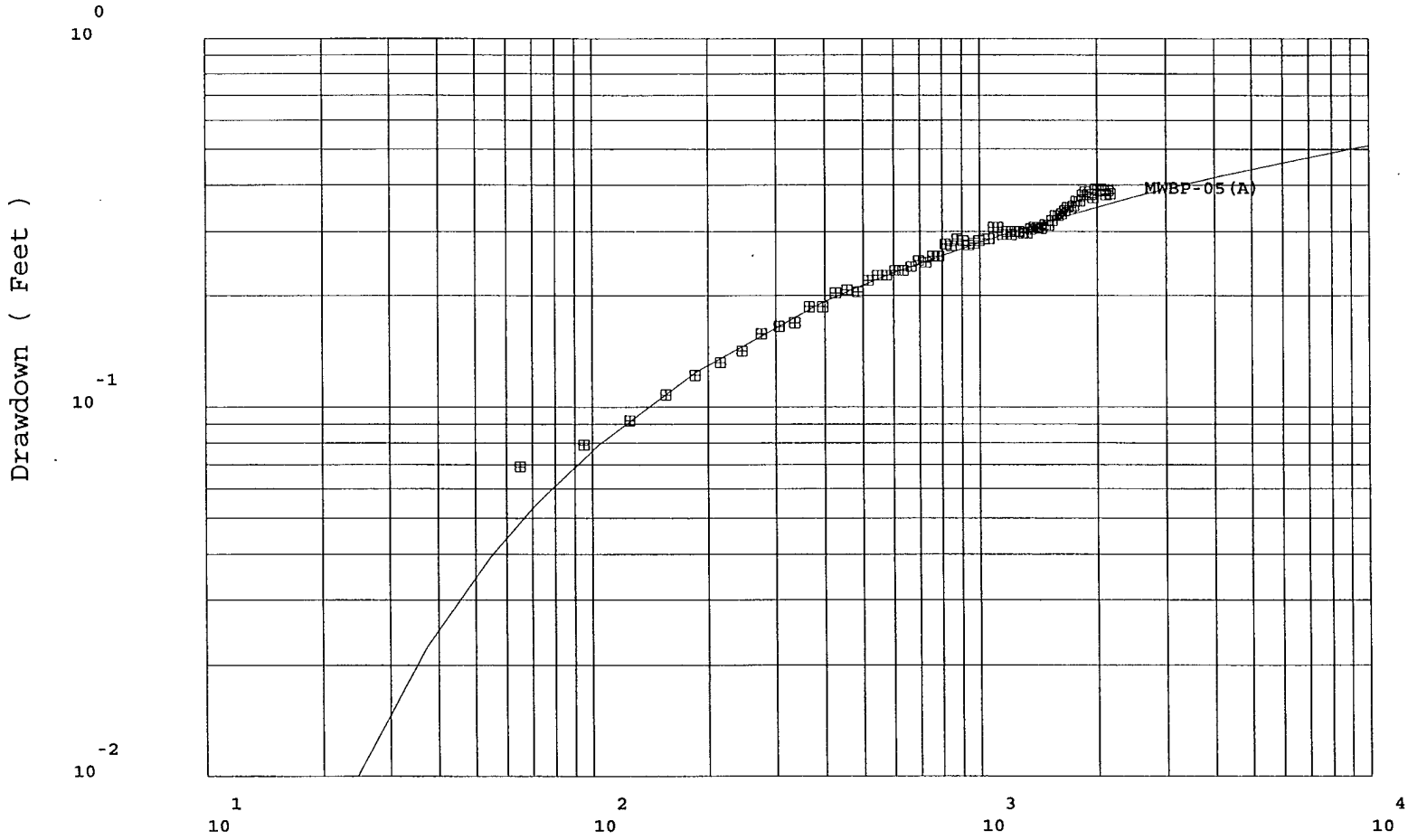
Modeling Group

[PUMPING TEST LOG-LOG ANALYSIS : Rtheis TYPE CURVE Confined]

Observation well : MWBP-05(A)
Distance r = 102.00 FT
Pumping well : MWBP-05B
Pumping rate Q = 16.00 USG/Min
Aquifer thickness b = 45.0 FT

Transmissivity T = 17951.080 USGPD/FT
Storativity S = 0.02394794
Hydr. conductivity K = 398.913 USGPD/FT^2
MATCH POINT :

1/u	=	0.0267538	1.00
W(u)	=	9.7900744	1.00
Time	=	1.00	37.38 Min
Drawdown	=	1.00	0.1021443 FT



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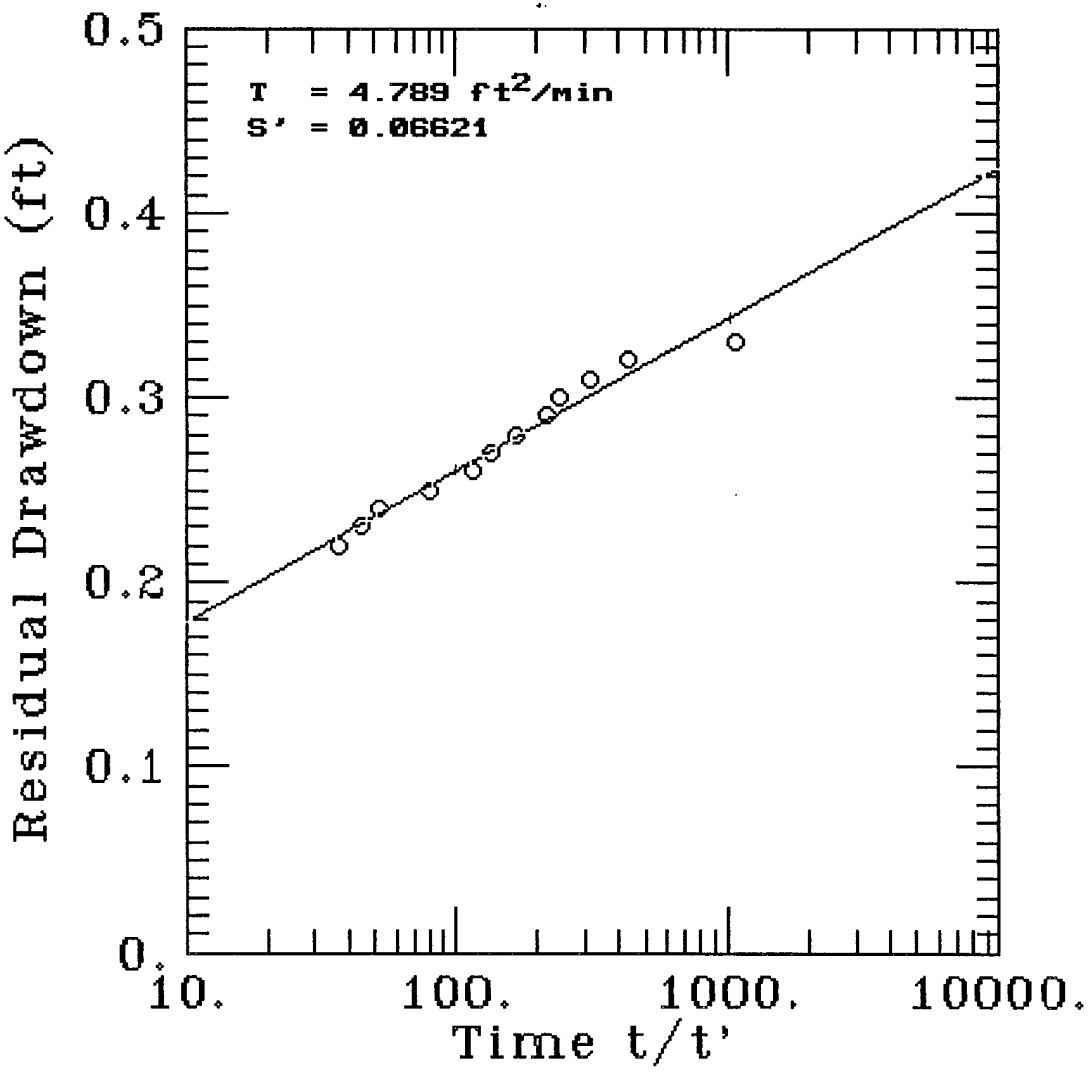
FRESNO ANG MWBP--05 RECOVERY TEST



3.2 In accordance with Theis (1935) recovery method, upon completion of a pumping test, recovery occurs at a constant rate with the residual drawdown given by:

$$s' = \frac{Q}{4\pi T} W(u) - W(u') \qquad (4)$$

where $u = \frac{r^2 S}{4Tt}$ and $u' = \frac{r^2 S'}{4Tt'}$

s' is the residual drawdown, Q is the rate of well recharge which is equal to the rate of well discharge, S' is the dimensionless storativity of the aquifer during recovery, and t' is the time since the cessation of pumping.

For r small and t' large, equation (4) can be written as

$$s = \frac{2.30Q}{4\pi T} \log \frac{t}{t'} \qquad (5)$$

A plot of residual drawdown s' versus t/t' on semi-log paper (t/t' on logarithmic scale) yields a straight line. The slope of the line equals $\frac{2.30Q}{4\pi T}$ so that for Δ s', the residual drawdown per log cycle of t/t', the transmissivity becomes :

$$T = \frac{2.30Q}{4\pi \Delta s'}$$

where Δ s' is the residual drawdown difference per log cycle of t/t'.

INTERNATIONAL TECHNOLOGY CORPORATION

By ATM Date 9/19/95 Subject Transmissivity Calculations Sheet No. 1 of 2

Chkd. By SAL Date 9/19/95 FRESNO ANG Proj. No. 404724

The Thiem-Dupuit method was used to calculate transmissivity of geologic materials in the shallow water-bearing zone and the deep water-bearing zone at the Fresno ANG, Fresno, California. The Thiem-Dupuit method is based on the equation :

$$Q=2\pi rK\frac{dh}{dr}$$

after integration between r_1 and r_2 with ($r_2 > r_1$)

$$Q=\frac{\pi K(h_2^2-h_1^2)}{\ln(\frac{r_2}{r_1})}$$

since h=D -s

$$Q=\frac{2\pi KD(s_1-s_2)}{\ln(\frac{r_2}{r_1})}$$

$$T = KD$$

$$=\frac{2\pi KD(s_1-s_2)}{2.30\log(\frac{r_2}{r_1})}$$

$$T = \frac{Q}{2\pi(s_1-s_2)}\ln(\frac{r_1}{r_2})$$

where s' is the corrected drawdown for late time data and $s' = s-(s^2/2D)$

1. Pumping MWBP-12 at 7.5 gpm with observation wells P-1 and P-2:

(i) At t = 1200 minutes $s'_1 = 0.858$ ft $r_1 = 15$ ft
$s'_2 = 0.193$ ft $r_2 = 50$ ft

$$T = \frac{2.30 \ x \ 7.5 \ gpm \ x \ 0.134 \ x \log(50 \ ft \ / 15 \ ft)}{2\pi(0.853 \ ft \ - \ 0.193 \ ft)}$$

where 0.134 = conversion factor gpm to ft^3/min

T = 0.292 ft^2/min

(ii) At t = 450 minutes $s'_1 = 0.786$ ft $r_1 = 15$ ft
$s'_2 = 0.137$ ft $r_2 = 50$ ft

T = 0.296 ft^2/min

2. A. Pumping MWBP-05B at 16 gpm with observation wells P-4A and MWBP-05 (Shallow water-bearing Zone)

(i) At t = 2160 minutes $s'_1 = 0.707$ ft $r_1 = 40$ ft
$s'_2 = 0.379$ ft $r_2 = 102$ ft

T = 0.981 ft^2/min

(ii) At t = 1205 $s'_1 = 0.65$ ft $r_1 = 40$ ft
$s'_2 = 0.294$ ft $r_2 = 102$ ft

T = 0.902 ft^2/min

B. Pumping MWBP-05B at 16 gpm with wells P-5B and P-3B as the observation points (deep water bearing zone).

At t = 2160 minutes $s'_1 = 0.306$ ft $r_1 = 99$ ft
$s'_2 = 1.519$ ft $r_2 = 20$ ft

T = 0.449 ft^2/min

1.0 Objective

To determine the effects of partial penetration on aquifer test results from aquifer test data obtained at the Fresno ANG Base. Hantush's (1961a, 1961b) modification tothe Theis method for partially penetrating wells was chosen as being the most applicable among several methods for P-3B.

2.0 Background

A constant rate discharge test was conducted in monitoring well MWBP-05B at the Fresno ANG Base for a period of 36 hours. The discharge rate was maintained at a constant 16 gallons per minute (2.139 ft^3/min) for the test duration. The pumping well partially penetrates a semiconfined aquifer which is about 45 feet thick. Drawdown measurements at four monitoring points were collected during the test. The only observation point in which supposed partial penetration effects were noted was in piezometer P-3B. This piezometer is located 20 feet from the pumping well and is screened over the exact screened interval as the pumping well.

Figure 1 shows the configuration of the pump test monitoring network and well geometries in relation to the hydrogeologic setting.

3.0 Method

The following discussion of the Hantush partial penetration method is taken from Kruseman and de Ridder (1991). This method is not applicable for the pumping well.

For a relatively short pumping time, the drawdown in a piezometer at a distance, r, from a partially penetrating well is, according to Hantush (1961a, 1961b):

$$s = \frac{Q}{8\pi K(b-d)} E\left(u, \frac{b}{r}, \frac{d}{r}, \frac{a}{r}\right) \qquad (1)$$

where

$$E\left(u, \frac{b}{r}, \frac{d}{r}, \frac{a}{r}\right) = E(u) = M(u,B_1) - M(u,B_2) + M(u,B_3) - M(u,B_4) \qquad (2)$$

$$u = \frac{r^2 S_s}{4Kt} \qquad (3)$$

S_s = S/D = Specific storage
B_1 = (b+a)/r (for symbols b, d, and a, see Figure 1)
B_2 = (d+a)/r
B_3 = (b-a)/r
B_4 = (d-a)/r
Q = discharge rate
K = hydraulic conductivity
D = aquifer thickness
s = drawdown at time, t
r = radial distance from pumping well
t = time with drawdown, s

INTERNATIONAL TECHNOLOGY CORPORATION

By S. Logan Date 10/24/95 Subject P-38 Pump Test Analysis, Hartush Sheet No. 1A of 4

Chkd. By BLP Date 11/2/95 Modification to the Theis Method, Proj. No. 409724

Fresno, ANG.

d = 106 - 96 = 10 ft
a = 111 - 96 = 15 ft
b = 116 - 96 = 20 ft
D = 126 - 96 = 30 ft

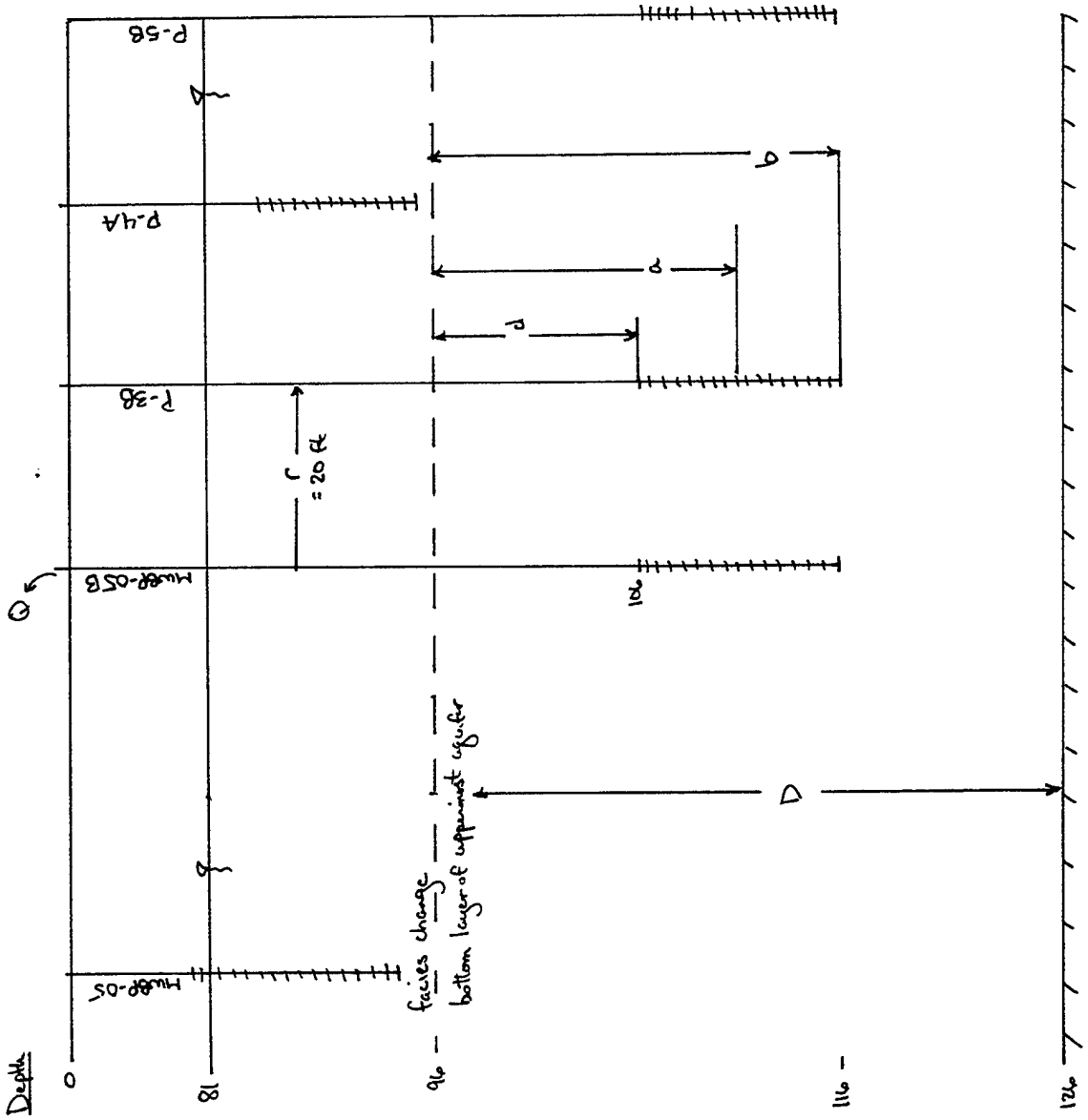


Figure 1
Well Geometries - Pump Test at MWBP-05B

Numerical values for M(u,B) are given in Kruseman and de Ridder (1991) and those which apply are included in Table 1 (see Section 5).

The following assumptions and conditions underly this method:

1) The aquifer is confined.
2) The aquifer has a seemingly infinite areal extent.
3) The aquifer is homogeneous, isotropic and of uniform thickness over the area influenced by the test.
4) Prior to pumping, the piezometric surface is nearly horizontal over the area that will be influenced by the test.
5) The aquifer is pumped at a constant discharge rate.
6) The well does not penetrate the entire thickness of the aquifer.
7) Flow to the well is in an unsteady state.
8) The time of pumping is relatively short: $t < [(2D-b-a)^2(S_s)]/20K$.

Discussion. Conditions 4) through 7) are met in this test. Given the type of alluvial aquifer system in which the wells are installed, Conditions 2) and 3) are not satisfied in their classic sense. As for condition 1), the aquifer has been assessed to be semiconfined, and portions of other tests react similar to confined aquifers. Applying a confined method is considered appropriate for the aquifer. Condition 8) will be assessed later in the calculation.

4.0 Procedure

- For one observation point, determine values for B_1, B_2, B_3 and B_4. Using these B values, find the values of $M(u,B_n)$ for different values of 1/u. Use equation (2) to calculate values for E(u) at various values for 1/u.
- Plot values of E(u) versus 1/u on log-log paper; this gives the type curve.
- At the same scale as the type curve, plot (corrected) drawdown versus time for the observation point.
- Match the data curve to the type curve. At relatively large values of time, the data should diverge from the type curve; this is to be expected because the type curve is based on the assumption that the pumping time is short.
- Select a match point "A" on the superimposed sheets and note values of s, t, E(u) and 1/u.
- Substitute the values for s and E(u) into equation (1) and calculate K.
- Substitute values of t, 1/u and K into equation (3) and calculate S_s.
- Data should be used from piezometers at a distance, $r < 2D$.

5.0 Application

This method was unable to be applied to the pumping well, MWBP-05B. Piezometer P-3B showed an effect from partial penetration and this method was used for it. Data from piezometer P-5B did not follow any classic response patterns and the Hantush method could not be applied to it. Responses in observation points P-4A and MWBP-05 followed that of a confined aquifer and did not show any effects of partial penetration or delayed yield; therefore, they were not analyzed by this method. Only the data from P-3B could be used

in this analysis.

Figure 1 shows the well geometry used in asigning values for b, d and a. These parameters were calculated not from the top of the water table, but from the contact between a coarse-grained and fine-grained material beneath the water table. This interface was used as the aquitard and is asserted to be the zone which is actually analyzed under this method. Table 1 provides the calculations for the various Bs and the function E(u). Values for M(u,B) are from Kruseman and de Ridder (1991).

Figure 2 shows the resulting type curve generated from 1/u and E(u) and Figure 3 shows the plot of drawdown data at P-3B at the same scale as Figure 2. A transparency for Figure 2 is also attached. The match point at E(u) = 1 and 1/u = 10 has values on Figure 3 of t = 0.58 minutes and s = 1.25 feet. Rearranging eq. (1) to solve for K with s = 1.25 ft, (b-d) = 10 ft (Table 1), and Q = 2.139 ft^3/min gives:

$$K = \frac{2.139\,ft^3/\text{min}}{8\pi\,(1.25\ ft)\,(10\ ft)} \times (1) = 6.81\times10^{-3}\ ft/\text{min} = 9.8\ ft/day$$

Given that the thickness (D) of the aquifer is 45 feet, the transmissivity, T, = KD = 9.8 x 45 = 441 ft^2/day.

Rearranging eq. (3) to solve for S_s with u = 0.1, t = 0.58 min and r = 20 ft, gives:

$$S_s = \frac{4\,(0.1)\,(6.81\times10^{-3}\ ft/\text{min})\,(0.58\ \text{min})}{(20\ ft)^2} = 3.95\times10^{-6}\ ft^{-1}$$

And the storativity, $S = S_sD = 3.95\text{x}10^{-6}(45) = 1.78\text{x}10^{-4}$ (dimensionless).

Assessment. The piezometer, P-3B, is located 20 feet from the pumping well. This satisfies the condition of r < 2D (60 feet). The time of pumping which appears to be applicable from Section 3.0 is $t < \{(2D\text{-}b\text{-}a)^2(S_s)\}/20K$.

$(2D\text{-}b\text{-}a)^2 = (60\text{-}20\text{-}15\ \text{feet})^2 = 625\ ft^2$. $625\ ft^2 \times 3.95\text{x}10^{-6}\ ft^{-1} = 2.47\text{x}10^{-3}$ ft.
Now $K = 6.8\text{x}10^{-3}$ ft/min and 20K = 0.136 ft/min. $2.47\text{x}10^{-3}$ ft/ 0.136 ft/min = 0.018 min or 1.09 seconds. This seems unreasonably low for pumping time. The chosen time of 0.58 minutes is about 35 seconds, which seems short enough to allow for the calculations to be considered valid.

6.0 Conclusion

The data set for P-3B exhibits the effects of partial penetration. Applying the Hantush method for partial penetration gives the following aquifer properties:

K = 9.8 ft/day
T = 441 ft^2/day
$S_s = 3.95\text{x}10^{-6}$ ft^{-1}
$S = 1.78\text{x}10^{-4}$.

7.0 References

Hantush, M.S., 1961a, Drawdown around a partially penetrating well, Journal of Hydraulics Div., Proc. American Society of Civil Engineers, Vol. 87(HY4), pp. 83-98.

Hantush, M.S., 1961b, Aquifer tests on partially penetrating wells, Journal of Hydraulics Div., Proc. American Society of Civil Engineers, Vol. 87(HY5), pp. 171-195.

Kruseman, G.P., N.A. de Ridder, 1991, Analysis and Evaluation of Pumping Test Data, 2nd ed., Publication 47, International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, 377 pp.

TABLE 1
Calculation of Values for E(u) Based on Equation 2

Setup: r = 20 ft
(see Fig 1) b = 20 ft
d = 10 ft
a = 15 ft

B_1 = (b+a)/r = 35/20 = 1.75 = 1.8
B_2 = (d+a)/r = 25/20 = 1.25 = 1.2
B_3 = (b-a)/r = 5/20 = 0.25
B_4 = (d-a)/r = -5/20 = -0.25 (not used in calculation)

	M(u,B)				Values used for interpolation of M(u,B) = 0.25.	
1/u	$M(u,B_1)$=1.8	$M(u,B_2)$=1.2	$M(u,B_3)$=.25	E(u...)[a]	$M(u,B_3)$=.20	$M(u,B_3)$=.30
1.00E+06	2.6968	2.0292	0.4938	1.1614	0.3969	0.5907
5.00E+05	2.6951	2.0281	0.4936	1.1606	0.3967	0.5904
2.50E+05	2.6927	2.0265	0.4933	1.1595	0.3965	0.59
1.66E+05	2.6909	2.0253	0.4930	1.1586	0.3963	0.5897
1.25E+05	2.6894	2.0243	0.4928	1.1579	0.3961	0.5894
1.00E+05	2.688	2.0234	0.4926	1.1572	0.3959	0.5892
5.00E+04	2.6827	2.0198	0.4919	1.1548	0.3954	0.5883
2.50E+04	2.6752	2.0148	0.4908	1.1512	0.3945	0.5871
1.66E+04	2.6694	2.011	0.4900	1.1484	0.3939	0.5861
1.25E+04	2.6645	2.0077	0.4893	1.1461	0.3933	0.5853
1.00E+04	2.6603	2.0049	0.4888	1.1442	0.3929	0.5846
5.00E+03	2.6434	1.9936	0.4864	1.1362	0.391	0.5818
2.50E+03	2.6197	1.9778	0.4831	1.1250	0.3883	0.5778
1.66E+03	2.6014	1.9656	0.4806	1.1164	0.3863	0.5748
1.25E+03	2.586	1.9554	0.4784	1.1090	0.3846	0.5722
1.00E+03	2.5725	1.9463	0.4765	1.1027	0.3831	0.5699
5.00E+02	2.5195	1.9109	0.4692	1.0778	0.3772	0.5611
2.50E+02	2.4447	1.861	0.4588	1.0425	0.3689	0.5486
1.66E+02	2.3875	1.8228	0.4508	1.0155	0.3625	0.539
1.25E+02	2.3395	1.7907	0.4441	0.9929	0.3571	0.531
1.00E+02	2.2975	1.7625	0.4382	0.9732	0.3524	0.5239
5.00E+01	2.1342	1.6527	0.4151	0.8966	0.334	0.4962
2.50E+01	1.9103	1.5008	0.3831	0.7926	0.3083	0.4578
1.66E+01	1.7454	1.3877	0.3590	0.7167	0.289	0.4289
1.25E+01	1.612	1.2951	0.3391	0.6560	0.2731	0.405
10	1.4991	1.2159	0.34185	0.6251	0.2993	0.3844
5	1.1026	0.9297	0.25825	0.4312	0.2084	0.3081
2.5	0.676	0.6015	0.18075	0.2553	0.1462	0.2153
1.66	0.4471	0.4122	0.13245	0.1674	0.1074	0.1575
1.25	0.3084	0.2913	0.09925	0.1164	0.0806	0.1179
1	0.2186	0.2101	0.07545	0.0840	0.0614	0.0895
0.5		0.0485	0.0213		0.0175	0.0251
0.25			0.0021		0.00176	2.44E-03
0.166			0.0002295		0.000195	2.64E-04
0.125			2.625E-05		2.26E-05	2.99E-05

a - $E(u,b/r,d/r,a/r)=M(u,B_1)-M(u,B_2)+M(u,B_3)$

Figure 2: E(u) type curve for P-3B well geometry

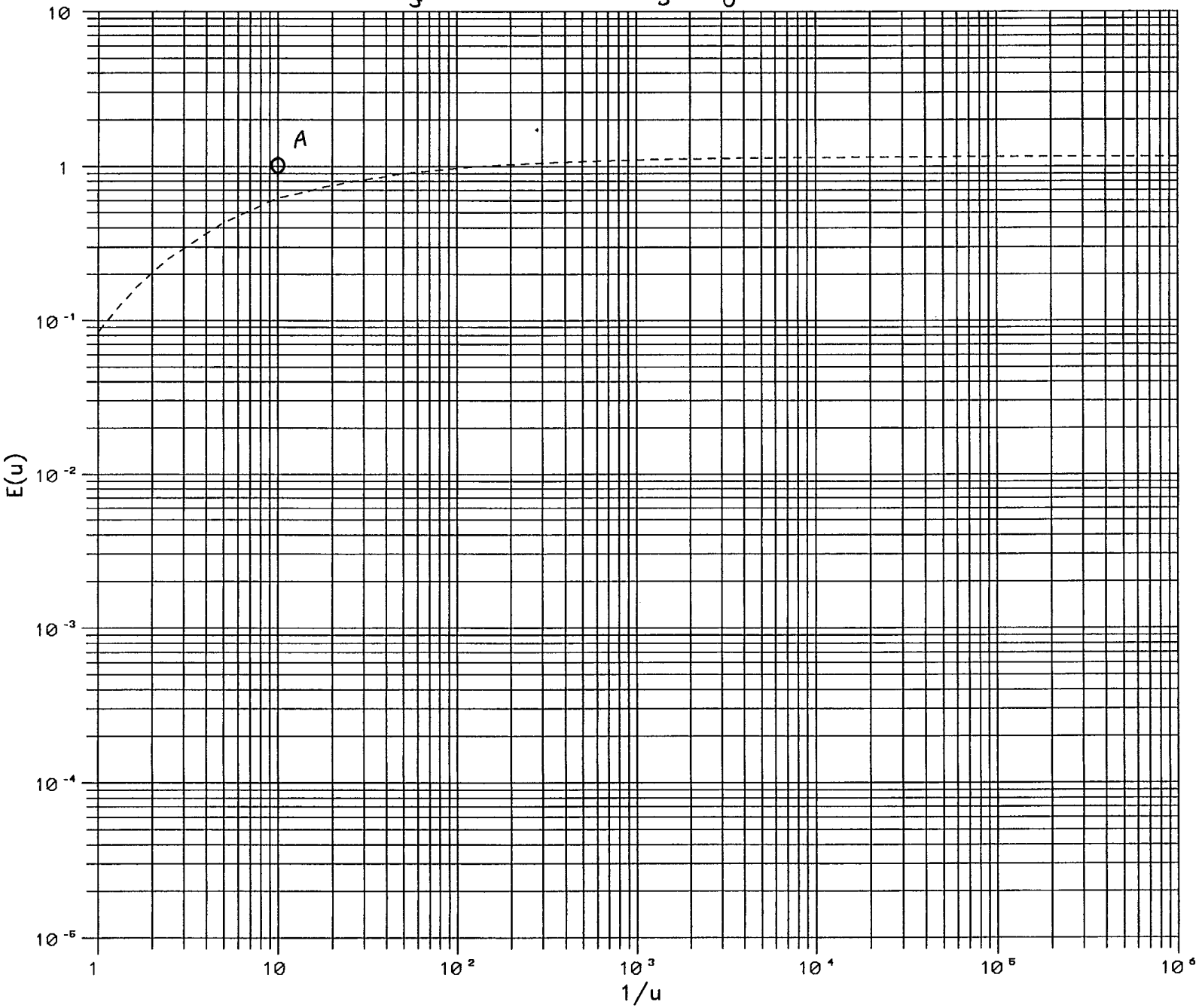


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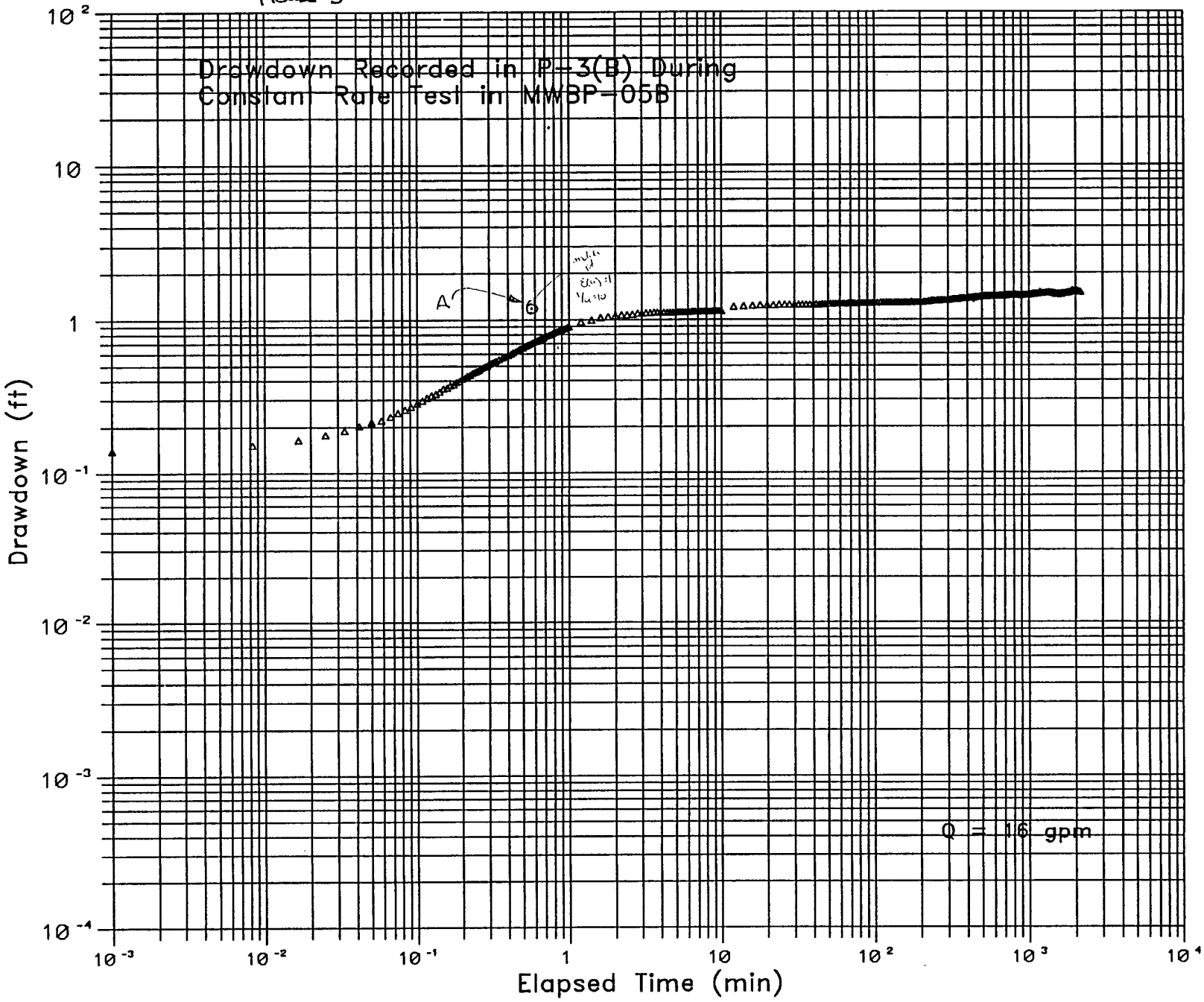
FIGURE 3



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